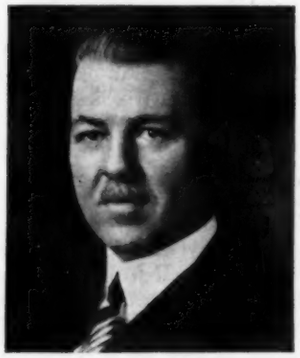
American Machinist
SEPTEMBER 9, 1936

EXPORTS LOOK UP

Unsatisfied demands for machine tools in Europe are opening to American products doors that had been closed by wage differentials and nationalistic import barriers



C. J. STILWELL
Vice-President, Warner & Swasey Co.

IT IS interesting to compare the machine tool export situation today with that existing one and two years ago, and with the position in which we found ourselves at the depth of the depression. From an average of $216,000,000 of industrial machinery exported annually between 1926 and 1930, we saw American machinery sales abroad drop to $55,248,000 in 1933. Then came the beginning of economic recovery—but machinery tool exports lagged discouragingly.

At this time last year it appeared that we faced almost insurmountable obstacles to the export of American machine tools. We had sold more abroad in the first six months of 1935 than in the whole of 1933, but this seemed insignificant compared with the trade of the '20's. Our difficulties divided themselves into four classes:

(1) Lower labor costs, resulting from a lower standard of living, and correspondingly lower overhead charges, which were underlying factors in the low selling prices on foreign made machine tools, against which it seems almost impossible for high priced, newly designed American machines to compete.

(2) The nationalistic spirit which had been so well developed over the past ten years, particularly in European countries, and more particularly in those nations which had in years gone by been our best customers. The spirit, "Buy British," "Buy French," that has been quietly but carefully developed in those countries, has proved an effective barrier to the continuance of previous export volumes.

(3) Almost every nation has, prior to the last two or three years, imposed restrictions, established quotas, or built up at least a beginning of a tariff structure that further increases the already high price of American machine tools laid down in the foreign customer's plant. Such restrictions, in whatever form they have taken, are only a further manifestation of the nationalistic spirit that followed the War, and expresses a desire on the part of one country after another to become self sustaining in the development and the manufacture of machine tool equipment, as well as many other materials and commodities. To those of us who have continued to maintain our export sources of business, the differential between American and foreign selling prices alone has seemed a sufficient protection for the industries of most countries, and the imposition of additional tariffs and restrictions has made the problem of machine tool exports at times look almost hopeless.

(4). Discussions and conferences, that had been held by some American machine tool men abroad, and which were reported back here from time to time, gave rise to the feeling that in part, at least, the imposition of restrictions and building of tariff walls abroad was the result of our own high tariff policy in years gone by.

After a fast trip around the ring of American machine tool export out-

lets it is interesting to take stock of the position as contrasted with a brief 12 or 18 months ago. Our machinery exports for the first 6 months of 1936 approximated $80,000,000, and were more than 40 per cent above last year. Conditions in many countries have changed radically. New influences are at work that have a serious effect on the domestic supply of machine tools in England, Germany, Italy and elsewhere. Indirectly those same influences affect the demand as well as the supply of machine tools in the generally recognized smaller export fields.

British Recovery Is Marked

In a rapid survey of the machinery position in Europe, the point of greatest interest is England. The British have now had several years of a balanced budget, under a sound thinking and sensibly administered government, which all leads to general business confidence. These several years of sound confidence have greatly increased employment, and put money in circulation, with the result of an increase in general buying all along the line. Many commercial and manufacturing lines are enjoying a demand that is above their normal. Their building program goes on without any apparent let-up, and from even the most casual observation one can see today that the construction industry is busily employed.

All of these things combine to produce in England a high degree of manufacturing and industrial demand, which in turn becomes a demand for machinery. In the last analysis, of course, it means a tremendous increase in the market for machine tools of all kinds.

Practically all of the machine tool builders in England are operating to the capacity of their plants, and many of the larger companies have sold their production ahead for anywhere from six months to a year. On top of all this, England is now engaged in furnishing its army and navy with new and improved equipment, and with this last added demand for machinery, the requirements have gone beyond the point where they can be satisfied in the home market. Once again England is faced with the necessity of importing machine tools from abroad.

A direct comparison with what seemed a year ago to be the determining issues for some time to come shows that, while the national spirit may be the same, the changed circumstances have nullified its force as the final determining factor.

While the legal restrictions remain, it is quite likely there will be some leeway in their administration. The efforts of our own government to revise our tariff by the negotiation of reciprocal trade agreements cannot but have a beneficial effect in the minds of foreign buyers. It is assumed that England will approach the negotiation of such an agreement with the same wise judgment and sensible compromise with which she administers most of her affairs.

The major problem in exporting machine tools to England still remains one of competing with lower priced British machines. It is quite possible that even this will change to some extent. It would appear from reports that one receives in traveling about England that she has for the moment reached the limit of her available skilled labor supply. To be sure, England still has her quota of unemployed as we have in this country. Many of them have been living on the dole for years. Some were described as having reached the age and state of mind where they will not or cannot be trained back to profitable employment as skilled workmen—certainly not in the metal trades.

A large proportion of the skilled workmen employed in England today are younger men who have been trained to skilled jobs within the past few years. The British have accomplished to a very considerable extent the training of new men for industry—a task that we are engaged in here; but which for the most part still lies ahead of us.

England has reached this peak of production in the machine tool industry over a period of several years, whereas we in America have been obliged to build up to our present production level in the brief space of a year and a half to two years. At no point have the British manufacturing plants been at the low level nearly comparable with the bottom which we reached in 1933. American machine tool builders not only had no opportunity to take on their pay rolls and train new men, but in practically all cases were obliged to suspend their existing apprentice training courses at a time when their plants were practically idle.

In England during this same period, machine tool builders with the help of their government were able to secure a substantial volume of business from Russia and other export sources, even though their domestic demand was at a low ebb. This enabled their plants to operate, at any rate, and some of them on almost a normal schedule. During this period, from 1929 to 1934, they were able to increase greatly their group of learners and apprentices, who now find themselves in a splendid position of full employment and good earnings. In this country we have had no such opportunity, and now that we face a rapid build-up, and a marked shortage of skilled workmen, it becomes our duty even more rapidly and in greater numbers to enroll large classes of apprentices and learners in order that we may have skilled workmen for the period of great demand that it is evident we must face in the next few years.

In the midst of this feverish activity in the whole iron and steel industry in England, some perfectly natural questions arise: Is this a wholesome demand for machinery, or is it an emergency war market? When the peak of the demand recedes will the machine tool industry in England again go into a long period of depression? Of what value can it be to American machine tool builders to ship their machines to England in such a period, when the domestic demand is at a high level? After a year or two of this will the British manufacturers revert again to the exclusive use of British made machines?

To a large extent it is true, of course, that British buyers will again

return to the slogan, "Buy British," and to using machines built in England, but the fact remains that there is a tremendous potential market in English plants for new and up-to-date machine tools. They have in that country, at least to the extent that we have, old and obsolete and out-of-date machinery that must be replaced.

America's opportunities to export machine tools to England after the peak of the demand is over will depend largely on how thoroughly British industry can be made to appreciate the excellence of design and construction of our machine tools during the present emergency, which has merely reopened the door.

Even though the cost of work being done in this country is steadily advancing, and rates of pay are constantly increasing, it does not argue that this will be entirely to the disadvantage of our exports. The same thing in a less degree is taking place and will continue to take place in Europe. Some increase in machinists' wages has already been made in England, and others will follow. To be sure, they proceed cautiously and more conservatively than we, but with the end of the supply of skilled labor in sight it is inevitable that wage rates will be affected as they always are in such periods of shortage.

The same general conditions which exist in England obtain to a greater or less degree throughout most of continental Europe. In Germany the iron and steel industry appears to be working to capacity, as it has been for several years past. With very few exceptions machine tool builders are still quoting very long deliveries. Most American machine tool builders are out of the German market, first because of the wide discrepancy between prices of American and German tools, but second, and more important, because of the difficulty of securing payment for any sales which are made. In a hasty trip through Germany one is impressed with the amount of work being done on every side. In addition to the new housing projects, new apartments, office buildings and industrial plants are being erected, and in every direction one looks, modernization and renovation seem to be the order of the day. Just as in this country, much of this work is undertaken as a means to get people to work, but there is one striking difference. Instead of a policy based upon the maximum percentage of the appropriation going directly into the hands of common laborers on the job, Germany has selected projects which appear to be of more lasting value to the community, and of a more permanent nature, and it is willing to spend any necessary percentage of the appropriation for materials and skilled labor, as well as for purposes of the dole. All of this work appears to have been done with the idea not only of putting people to work, but of accomplishing something worth while for the country.

Throughout Europe, even in the smaller countries, such as Switzerland, Holland, Belgium and Sweden, there is an abundance of activity. As contrasted with visits made in these countries during any of the last half dozen years, people seem far more happy and contented and prosperous.

Much is being asked about preparation for war—whether or not this feverish activity is all due to war preparation. Not necessarily so. Certainly in these smaller countries the production seems to arise from normal peace-time demands, and little, if any, of their demand for machine tools, particularly in these countries, would arise from any considerable program for munition building.

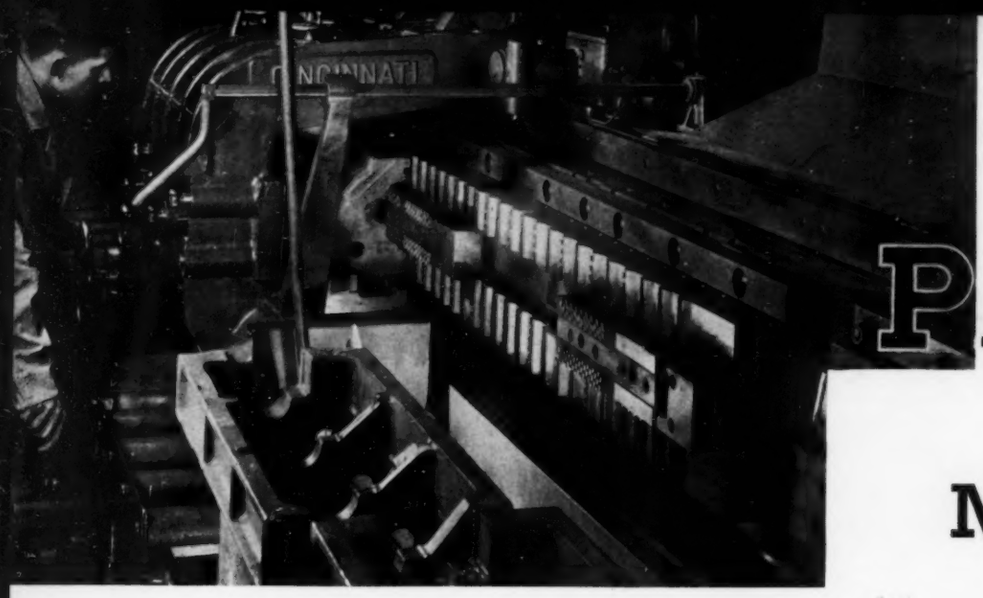
In England, merely because a portion of machine tool production is going into government programs, one need not draw too warlike conclusions. The automobile industry is still the biggest buyer and user of machine tools. Very little has been done in that country for many years to modernize army and navy equipment, and bring it up to date. The situation is quite comparable with our own. Here we have seen our own government purchase equipment within the last few years for our own arsenals and navy yards. Certainly that does not mean we have any plan or prospect of entering war at any near date.

France's Recovery Lags

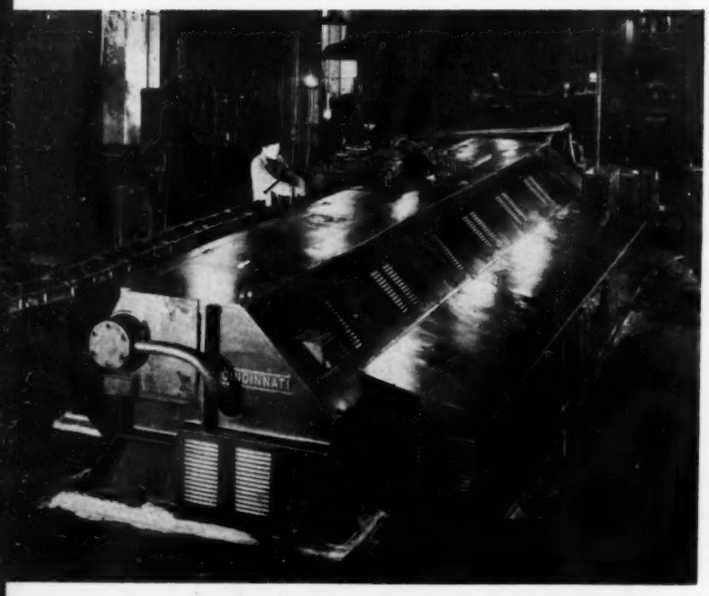
France presents the only exception to an otherwise uniformly active and prosperous Europe. France has had no generally sustained period of prosperity now for several years. The value of her money in terms of other exchange has priced her products high for export. The cost of living has been gradually rising, while wages remained at ridiculous levels. It is true that during part of 1934 and in 1935 industrial and commercial activity enjoyed a healthy spurt, but with the political developments of recent months the confidence of manufacturers and merchants has been badly shaken. At the moment they are in a period of depression—not as severe, to be sure, as the one we have had, nor is there any possibility of its lasting as long, but it is serious for the French manufacturers at the moment.

The present situation in France just as in our own long depression arises largely from a loss of confidence. Merchants, employers, manufacturers, and industrialists do not know what plan their present government will follow in the making of new restrictive laws.

With respect to machine tool demand, there is very little in France at this moment, but what is true of all Europe is probably even more true in that country. Very little real modernization has taken place throughout the iron and steel industry since the war. It means that here again there is building up constantly what some day will break loose as a tremendous demand for new and modern machine tools. Already wages have been increased. Further wage increases in France are inevitable. If workers in France are to be given greater compensation, and without increasing the cost of product out of all proportion to the market, it must be accomplished by the same means as has always been employed in other parts of the world —by the introduction of new and improved machinery.



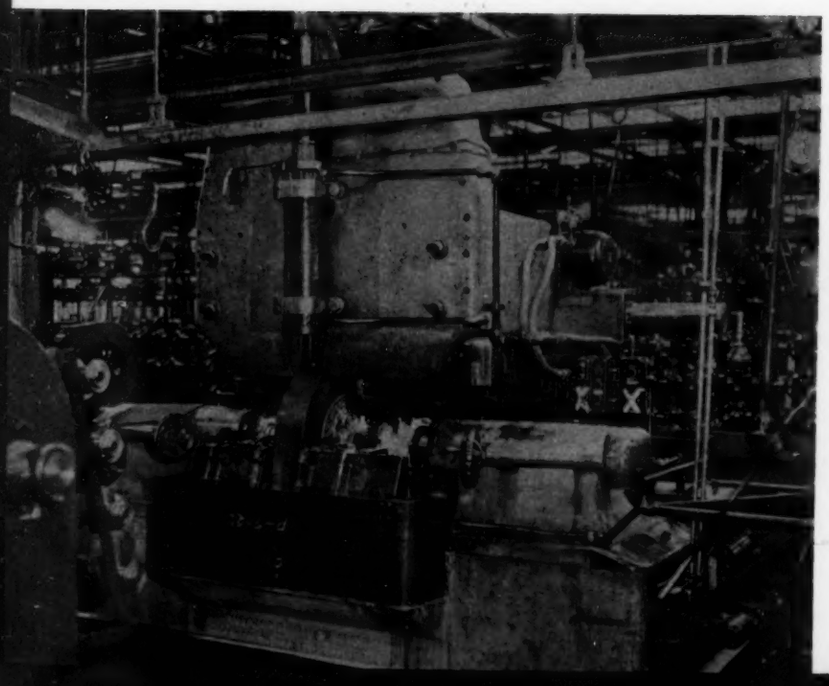
PACKARD MACHINES



● *Above*—Bottoms of the cylinder blocks and main bearing rabbets are surface broached in a giant multi-tooled machine

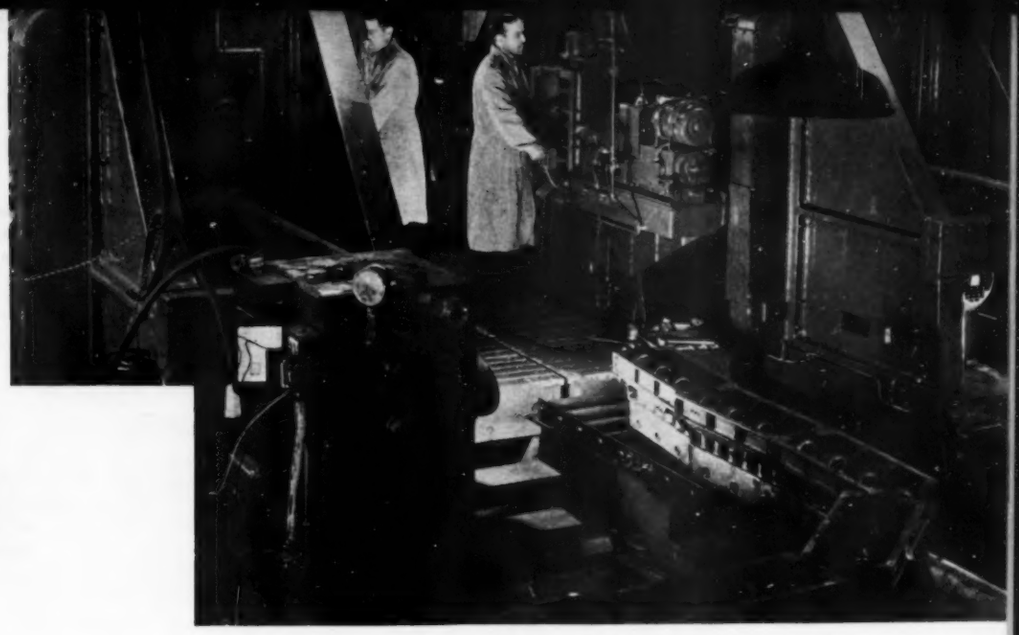
● *Left*—Practically a duplicate of the machine shown above is that for broaching the tops of both six and eight cylinder blocks; the rear view gives an excellent idea of its size

● *Lower left*—All main crankshaft bearings are circular broached on a special machine built by Wickes, the first of its kind



● *Below* — A spot welding jig is used to assemble various parts to the rear quarter panels

NEW SIX



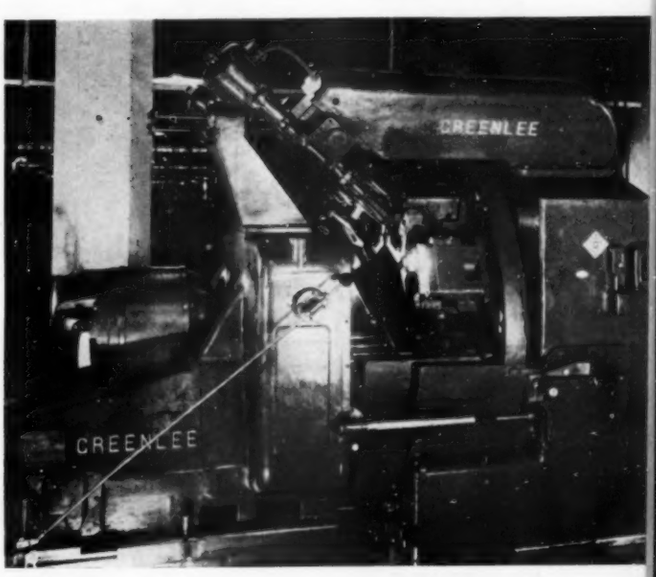
● *Above*—At the left a vertical drum-type machine drills and reams the holes for the valve stem guides and the valve openings; the machine at the right drills and reams the distributor shaft hole in the block

ANTICIPATING a production in the next 12 months far exceeding that of any year in its history, the Packard Motor Car Company has spent $5,100,000 to double its plant capacity at Detroit. On September 5 it announced the long-heralded Packard Six, a new member of its passenger-car family. It now is in production on four complete lines of cars.

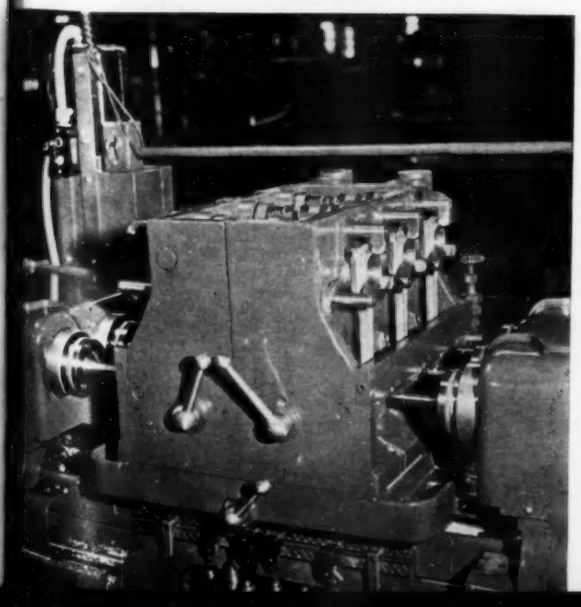
By the end of 1936 Packard will have finished a three-year general development and manufacturing expansion program at a cost of $18,000,000. Recently, particularly in preparation for building its Packard Six, the company has purchased large quantities of machinery and plant equipment and has rearranged its factory.

Here are shown the first photographs of some of the machine tools now producing the 1937 Packard parts.

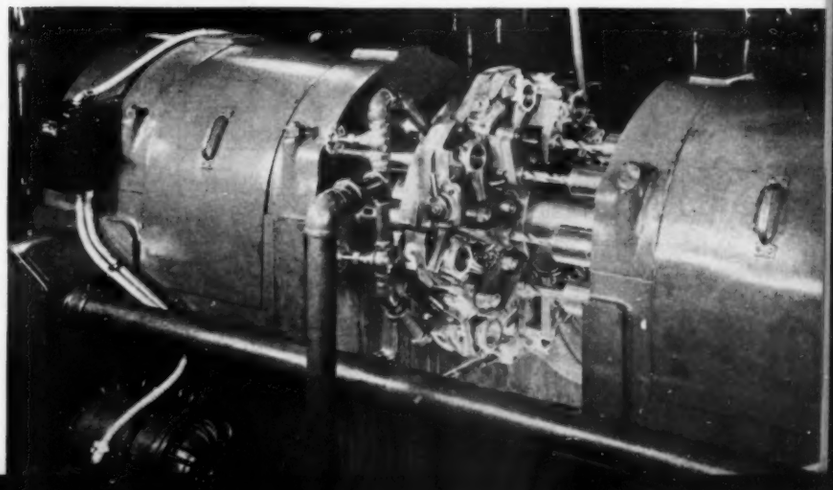
● *Below*—This Greenlee machine drills and taps stud bolt holes in the connecting rod



● *Below*—In a rotary fixture, containing eight positions, the small end of the connecting rod is automatically drilled and reamed



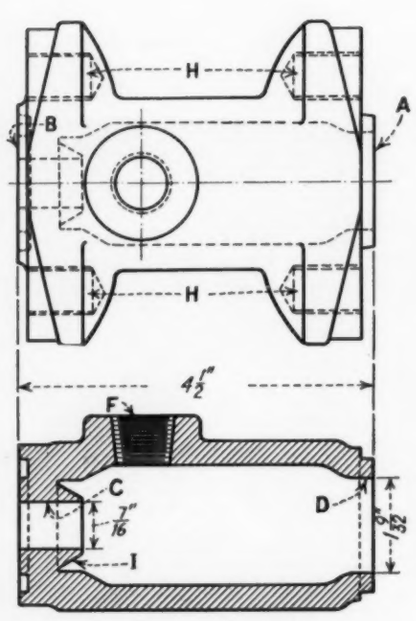
● Piston pin bushings are diamond bored in this precision machine

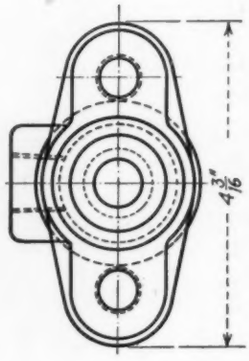


A CHANGE-PROOF JIG

CHARLES C. TOMNEY
Chief Tool Designer
Carrier Engineering Company

AFTER making a separator in several sizes for a number of years, we changed the design. Formerly each size of this part was bored and faced in a turret lathe which used an individual box jig for drilling and tapping. But after the change was made, we had to throw the box jigs away. Rather than be faced again with this situation, we determined to make a universal jig that could be used even though the part went through further design changes. The part is produced in limited production, the yearly demand for each size being only about 2,000 pieces. Therefore, we decided to design a jig that would permit operations on all sizes to be done on one machine as otherwise several machines would be tied up.



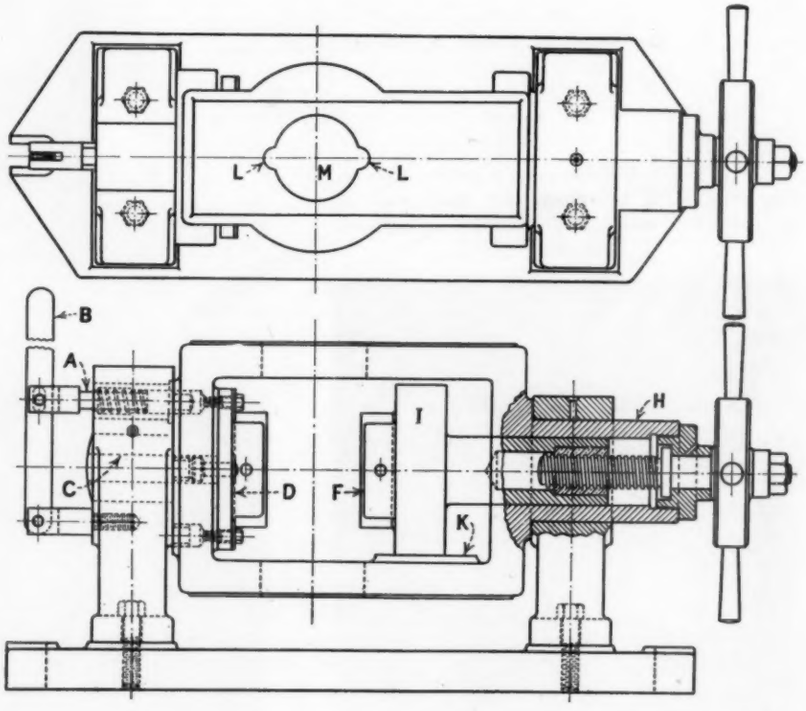


THE WORK

Fig. 1—Flanges added to this and other sizes of separators caused scrapping of the box jigs formerly used

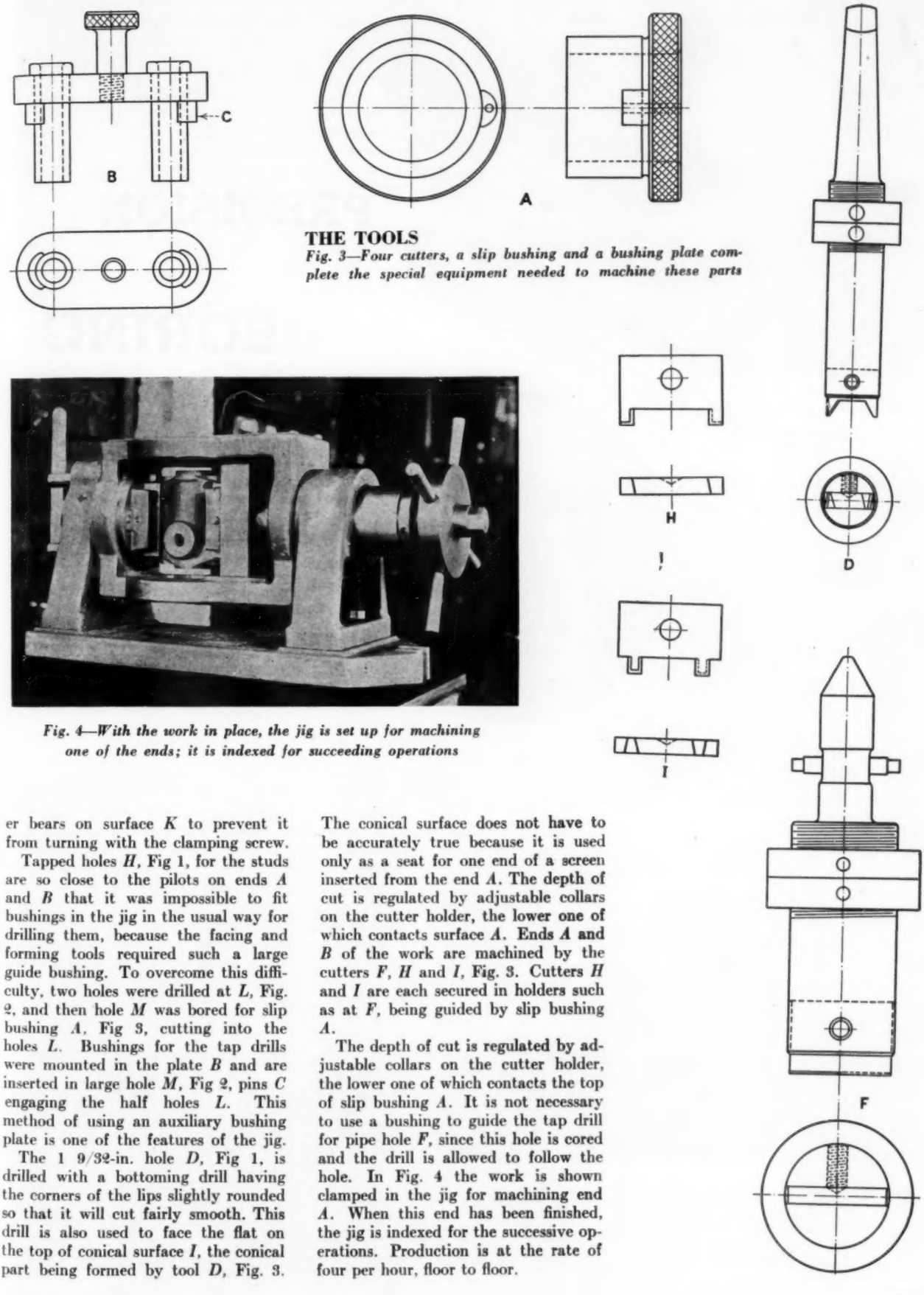
In the indexing jig illustrated in Fig. 2, the different sizes of separators are located and held by interchangeable jaws. The jig was designed for doing all the work in a radial drill. Fig. 1 shows one of the parts; operations consist in machining ends *A* and *B;* drilling and tapping 7/16-in. hole *C;* drilling 1 9/32-in. hole *D;* drilling and tapping hole *F* for ½-in. pipe; and drilling and tapping four holes *H* for ⅝-in. studs. It is necessary to take only one facing cut on ends *A* and *B*, because all joints are made tight with lead gaskets.

Referring to Fig. 2, the left-hand end of the rotating part is bored and reamed to receive hardened bushings for indexing. Index pin *A* is backed by a helical spring and is operated by lever *B*. A 1-in. hole is bored true with trunnions at *C* to fit the shank of the stationary jaw holder *D*. A screw fitted with a handwheel is used to operate movable jaw *F*. Trunnion *H* is bored to receive the shank of holder *I* for the movable jaw. The bottom of this hold-



THE JIG

Fig. 2—Interchangeable jaws and an auxiliary bushing plate make this jig adaptable to design changes and to various sizes of separators



THE TOOLS

Fig. 3—Four cutters, a slip bushing and a bushing plate complete the special equipment needed to machine these parts

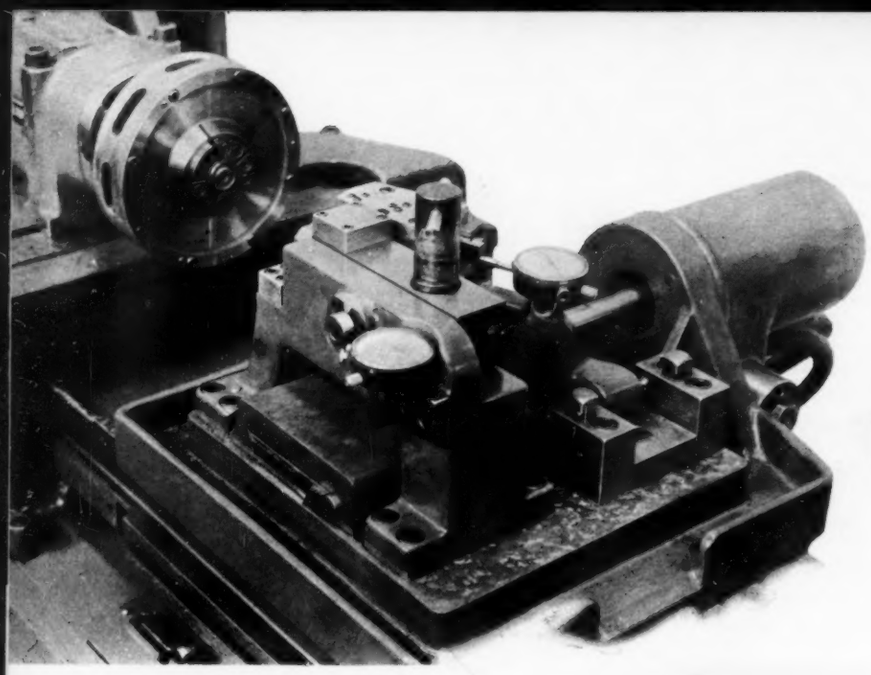
Fig. 4—With the work in place, the jig is set up for machining one of the ends; it is indexed for succeeding operations

er bears on surface *K* to prevent it from turning with the clamping screw.

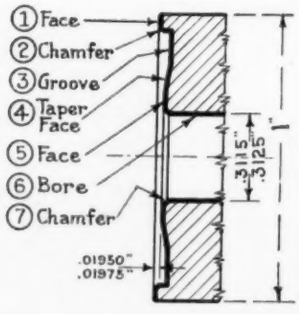
Tapped holes *H*, Fig 1, for the studs are so close to the pilots on ends *A* and *B* that it was impossible to fit bushings in the jig in the usual way for drilling them, because the facing and forming tools required such a large guide bushing. To overcome this difficulty, two holes were drilled at *L*, Fig. 2, and then hole *M* was bored for slip bushing *A*, Fig 3, cutting into the holes *L*. Bushings for the tap drills were mounted in the plate *B* and are inserted in large hole *M*, Fig 2, pins *C* engaging the half holes *L*. This method of using an auxiliary bushing plate is one of the features of the jig.

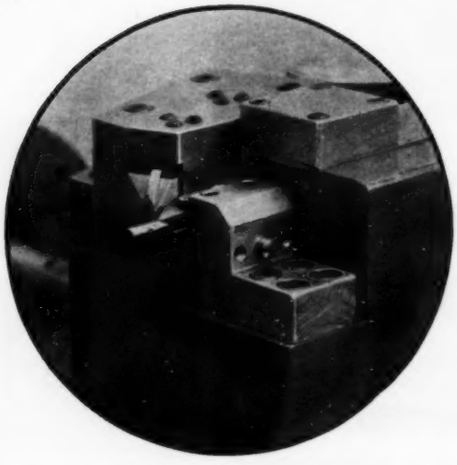
The 1 9/32-in. hole *D*, Fig 1, is drilled with a bottoming drill having the corners of the lips slightly rounded so that it will cut fairly smooth. This drill is also used to face the flat on the top of conical surface *I*, the conical part being formed by tool *D*, Fig. 3. The conical surface does not have to be accurately true because it is used only as a seat for one end of a screen inserted from the end *A*. The depth of cut is regulated by adjustable collars on the cutter holder, the lower one of which contacts surface *A*. Ends *A* and *B* of the work are machined by the cutters *F*, *H* and *I*, Fig. 3. Cutters *H* and *I* are each secured in holders such as at *F*, being guided by slip bushing *A*.

The depth of cut is regulated by adjustable collars on the cutter holder, the lower one of which contacts the top of slip bushing *A*. It is not necessary to use a bushing to guide the tap drill for pipe hole *F*, since this hole is cored and the drill is allowed to follow the hole. In Fig. 4 the work is shown clamped in the jig for machining end *A*. When this end has been finished, the jig is indexed for the successive operations. Production is at the rate of four per hour, floor to floor.



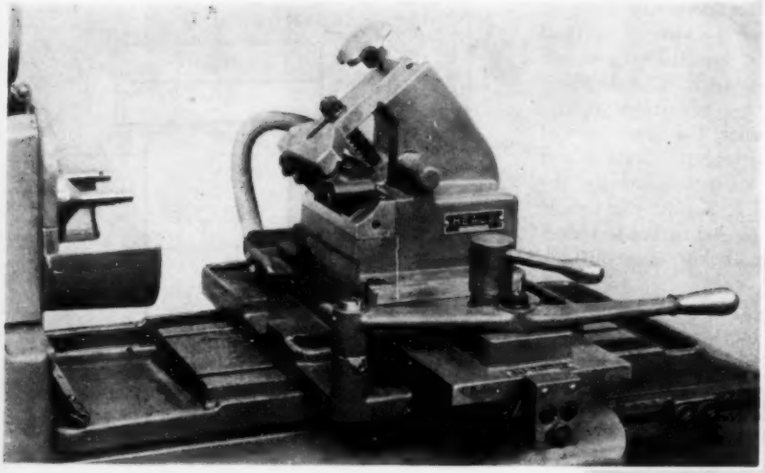
PRECISION BORING



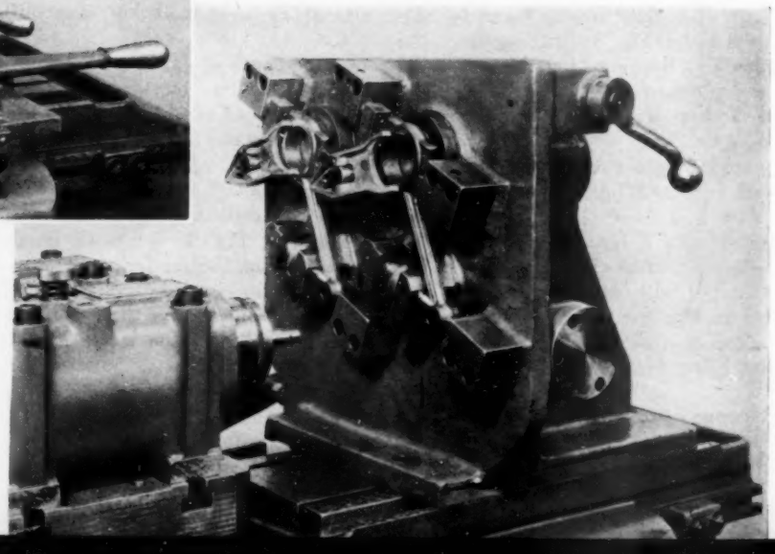


■ *Small piston*—Seven tools operate within a 1-in. diameter. Operations are: (1) face outer face, (2) chamfer inner edge outer face, (3) cut groove, (4) taper face, (5) face inner face, (6) chamfer edge of hole, (7) bore hole. Boring tools are mounted in special fixtures attached to the machine table; facing tools are fixed to a cross slide which has transverse movement, hydraulically actuated. Amount of both feeds is shown by dial indicators. A pneumatically controlled diaphragm chuck holds the work

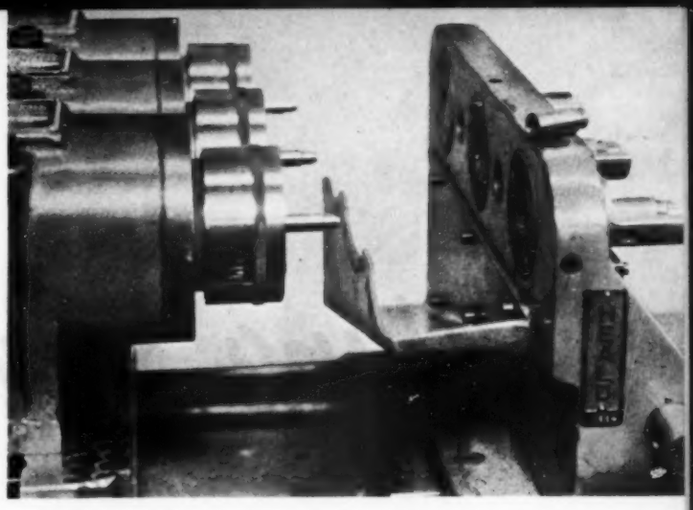
■ *Connecting rod*—Two at a time, the bronze bushed Lincoln wrist-pin holes are bored with carbide tools. The fixture, quick-acting and hydraulically operated, is arranged for single lever control. As the table moves inward at rapid traverse the finger clamps rotate through 90 deg. and hold the crank ends against the backing plate. Before the boring position is reached, cam eccentrics operate the centers which hold the wristpin ends. Then the table automatically slows down from rapid traverse to boring feed. This set-up bettered anticipated production by 40 per cent



■ *Valve lifter bracket*—An angle fixture holds and locates this V-8 motor part. Two holes are bored simultaneously; then the fixture is unlocked and indexed for the other two holes



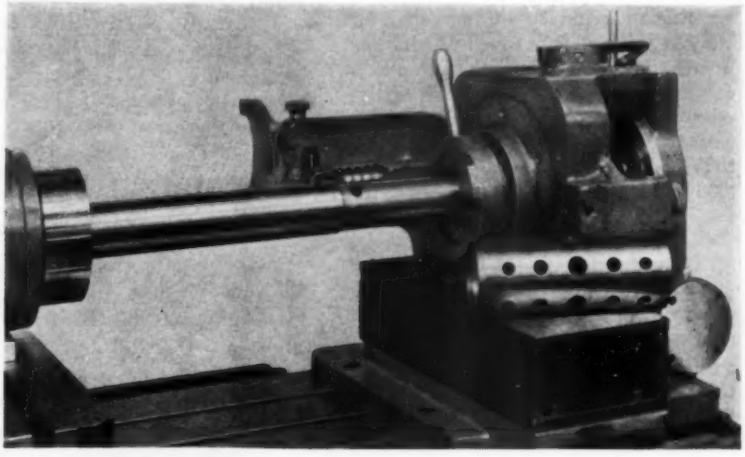
■ *Tappet bushings*—Made of cast iron, these Wilcox-Rich bushings have a 7/16-in. hole to be bored concentric with the O.D. A feature of the three-station fixture is the way the sleeves project to the rear of the base, forming troughs to hold an extra workpiece for each station. A single hand lever actuates a clamping wedge at each station to hold the tappet bushing which is located by a spring loaded finger. After the cycle is completed, the clamp is released, and the operator pushes the unbored bushings through the trough ejecting the finished pieces

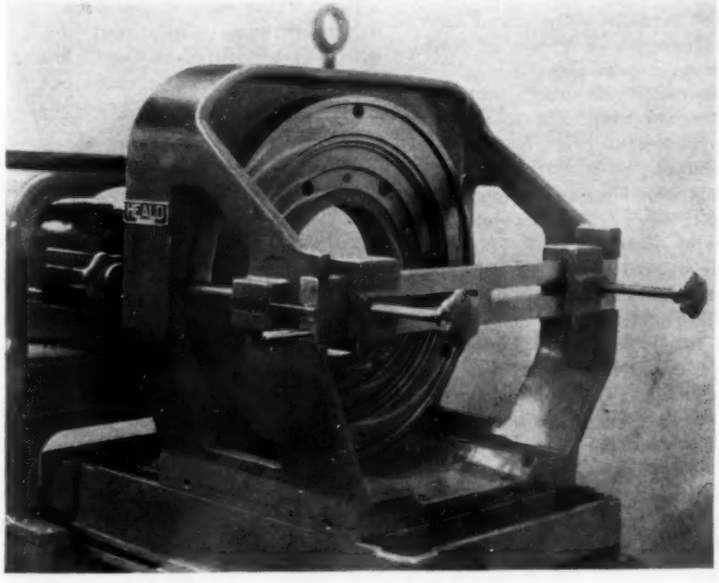


SET-UPS

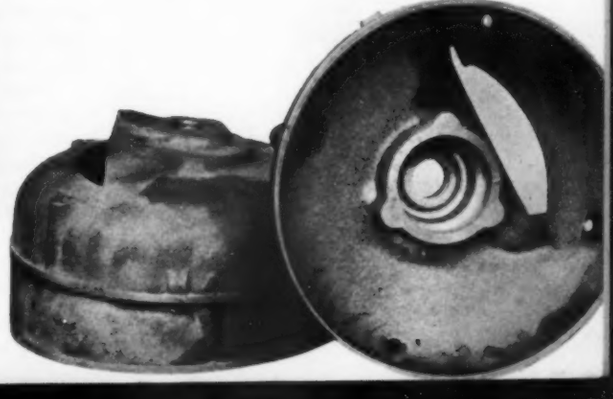
SIX JOBS, each presenting a particular problem, give a good idea of the range of work adaptable to modern precision boring. The growing popularity of this machining method is traceable to the accuracy and fine finish that it achieves. Operations illustrated are performed on Heald Bore-Matics.

■ *Interrupted sleeve*—An example of large work is this tapered piston valve bushing used by the Westinghouse Air Brake Company. Made of semi-steel, its 2 7/16-in. diameter is literally full of holes. The fixture, bolted to the table, consists of front and rear sleeves with a hand-operated ejector in front and ball-bearing bar support in the rear. The support is swung down, out of the way, during loading of the work which is done from the rear of the machine. Concentricity is held within 0.001 in. despite the interrupted surface

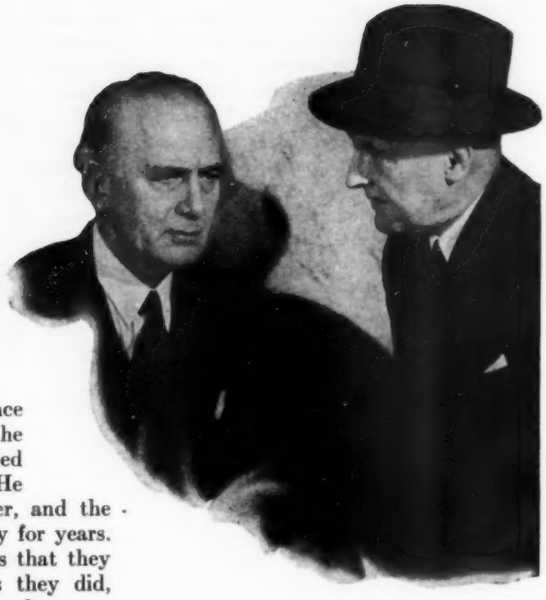




■ *Motor end shield*—A complete line of cast-iron end shields, made by the U. S. Electrical Manufacturing Corporation, can be bored in this fixture. With the stepped adapter illustrated, six different sizes up to 22⅞ in. rabbet diameter and corresponding bearing seat diameters from 3⅛ to 7½ in. can be handled. Clamping is provided by a bar which swings into position and is held by a latch. Two adjustable hand knobs on the bar may be moved laterally to suit various sizes of shields



Talking Shop



Long Deliveries

On every hand we hear the same complaint—how can we get quicker delivery of machine tools? A salesman in Pennsylvania says that he would be sitting pretty if he could get deliveries as easily as he can get orders. A builder admits to having been approached for 40 tools of a certain type for England, and 30 of the same for Italy. He couldn't touch the orders because he is many months behind on domestic orders. In England, deliveries of the same type of tool are now two years. Our London office says that this long delivery problem is likely to hold in the British market for from one and one-half to three years.

One of the annoying consequences of this situation is the likelihood of machines getting to customers short one or two attachments, or with an oil hole or two undrilled. Both builders and buyers will have to tighten up their inspection to catch the slips before any damage is done. Recriminations do no good. The trouble is a penalty of active business, and we can stand a little such trouble to make up for what we've been through.

Instruction Books

Believe it or not, this really happened, and in a first class shop, too. Four out of a battery of two dozen engine lathes were found to be in good enough shape, after years of hard word, to be transferred to the maintenance department. One day an operator broke a carriage clamp screw and

the carriage had to be taken apart to fix it. When it came down the maintenance foreman discovered an eccentric driven plunger pump that was intended to lubricate the bearings in the carriage. Its existence had been a secret so far as he was concerned, so he called over the lathe foreman. He had not known of it either, and the lathes had been running dry for years.

Speaks well for the lathes that they would function as long as they did, but not so well for the men who never investigated to see why there were no oilers on the carriage. Their conclusion was that the maker of the lathes should have supplied a better instruction book, and they applied the same criticism generally to other machine tool builders. Perhaps it's a point worth investigating.

Simpler Machine Tools

Every so often somebody brings up the old controversy about the complexity of machine tools. The com-

plaints don't seem to center about any one type, they hit each one in turn with generous impartiality.

To each man who wants only a stripped machine, and expects considerable reductions in price because of the omission of the usual equipment, his demands sound reasonable enough. Why should he pay for gadgets he can't use and doesn't want?

But if he wanted to buy an automobile to use only in the daytime would he expect to get a reduction if he ordered one without lamps? The cases are not quite parallel, of course, because automobiles are built in large lots, machine tools in small lots.

From the machine tool builder's point of view it is good business to build the kind of machine the majority of his customers want. Obvously, most of them want one that will do as many jobs as possible. At the same time there is an opportunity for some one to establish a comfortable little business catering to the needs of simple-minded customers. It has been done in the electric motor field, where some of the smaller companies specializing in single orders or small lots of unusual types have done very well indeed.

Hot Water and Automobiles

There would seem to be little connection between the amount of hot water used in a large machine plant and the number of automobiles used by the men. But a recent survey in one such plant showed a direct relationship, much to everyone's surprise. Checking up on the cost of heating water for the shop it was found that it had dropped almost out of sight since the upturn of business. Inquiry of some of the men brought out the reason, which no one had suspected.

"You see, boss, it's this way. Most of us had to sell our cars during the depression—and walk to work—or ride in the bus. We didn't want to go through the streets with our hands and faces dirty. So we washed up in the shop. Now we've got cars again and we don't stop to wash up but hit the road for home and wash up there." And it's saving quite a lot of hot water in this plant.

ARC TOOTH GEARS

FRANCIS W. SHAW
Whitworth, Lancashire, England

For light duty, circular arc profiles, having smooth highly efficient action, may be readily generated and ground

SOME SPECIALISTS in apparatus, such as weighing machines, pressure measuring devices and clockwork, in which the duty is fairly light, still prefer the now almost extinct cycloid or some modification thereof for their gear-tooth profiles. They believe tooth action is freer, frictional resistance more constant and pressure on pivot bearings less than with the involute form.

Whatever the justification for this belief, in delicate apparatus it is essential that the gears be as frictionless as possible and that the efficiency remain nearly constant throughout rotation. To these ends, where the face width of the gears is not unduly restricted, helical edge-tooth gears (more simply, edge gears), such as Fig. 1 depicts, but with their edges thickened as shown at *B*, have been proposed in the belief that, as the contact is confined to the pitch helices, action must be almost frictionless.

George B. Grant, alluding to edge gears in his "A Treatise on Gear Wheels," claims that "the friction is theoretically nothing, as there is no sliding of the teeth on each other." This statement overlooks the fact that if the teeth do not slide upon one another in planes normal to the axes, they do rock or roll upon one another in the direction of their axes. Even pure rolling friction may be momentous if the edges in contact are so meager that the specific load would engender stresses in the material near to the endurance limit.

It is illogical, as Grant does, to dismiss a proposed improvement with the words "if the edges are thick, the action will be stronger, but there will still be but one point of contact," for unless the very object of edge teeth is to be defeated, the thickening must be done with discretion. Otherwise the profile

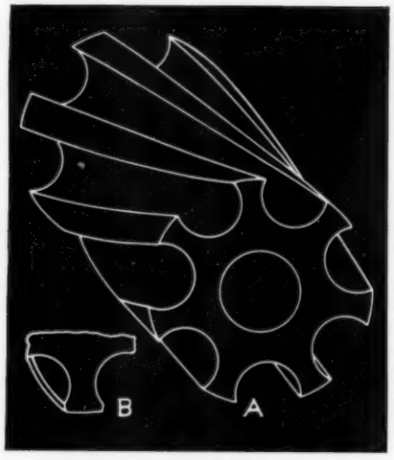


Fig. 1—In fundamental helical "edge tooth" gears, if part of the helix is always upon the line of centers the gears will be in action

form may become such as either to interfere with the helical action or to introduce a line of action from which sliding is inseparable.

My purpose is to illustrate how edge gears can be rendered extremely serviceable, where steady and silent action with high efficiency are desired, and to show how they are capable of far greater loads than those for which casually designed teeth would cater. Further, I shall tell how the edges may be so formed that the valuable feature, of the involute, namely, center adjustability, may be retained.

In perfect helical gears having conjugate tooth profiles the action may be said to be dual, for the motion is controlled not only by the tooth profiles but by the pitch helices. In imperfect helical gears, as all are, irregularities of profile and helix give rise to pulsation with consequent variable torque reactions at different angular positions of the teeth. Such variability is not easy to compensate for in delicate mechanisms. To eliminate this duality of control there is but one remedy—so to form the teeth that the action is confined to the pitch helices. And that signifies that the line of action must be abolished. How this may be done without seriously affecting the durability of the gears is the problem.

Theoretically, to confine the action to the pitch helices is a simple matter. It entails but the relieving of the profiles as shown by Fig. 2. Obviously, if conjugate profiles remain in contact as the gears rotate at constant velocity, the relieved parts cannot have contact at the constant velocity that perfect helices would impart. In practice the relieving must be sufficient to allow for the inevitable form and helix errors. Otherwise sliding contact might still exist at points away from the pitch helices when these were together on the line of the centers.

The question arises: if there is no contact except at the pitch helices, of what

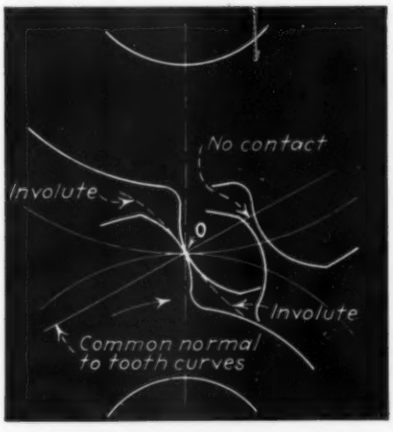


Fig. 2—By relieving the tooth profiles the action is confined to the pitch helices

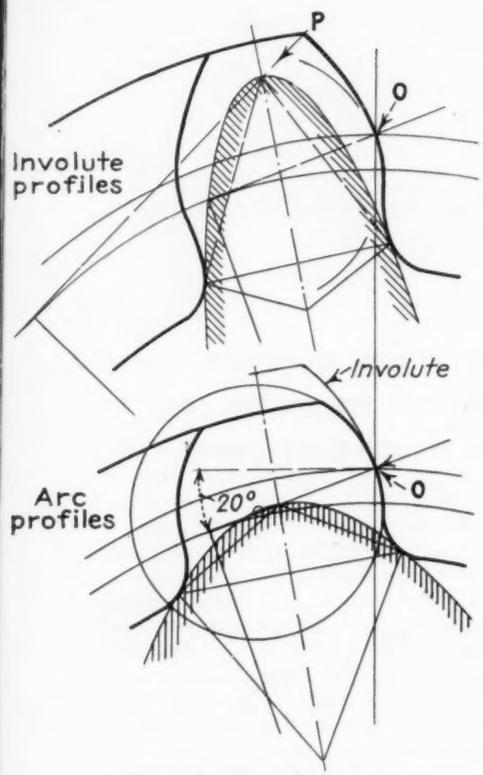


Fig. 3—In arc teeth the pressure is concentrated at or near the pitch point 0. The parabolas indicate that the arc tooth is stronger than an involute tooth of the same pitch

use are the teeth, might they not be shortened indefinitely? The answer is "no," for photo-elastic experiments have demonstrated that the lines of force between convex surfaces such as cylinders and spheres extend far beyond the contact points. Therefore the removal of any material into which the lines extend would subject the remaining material to greater displacement under the load and so increase the friction which to a great extent is the cause of rolling resistance.

Nevertheless, for the light loads many gears are called upon to bear, the teeth might be considerably shorter than standard. As shortening may generally be accompanied by corresponding pitch reductions, either the number of points sharing the load might be increased, or the helix angle necessary for continuous action reduced. Either alternative has the result of diminishing the specific tooth pressure.

Next to the straight line, the circle lends itself best to accurate reproduction. But the circle cannot appear in the transverse sections unless the cutter form be allowed some departure from the circular, for reasons that will be well understood. Manifestly, it is easier to embody the circles in the cutters or the abrasive wheels than in the teeth. Moreover, circular forms are readily produced by grinding.

For convenience, however, in studying tooth shapes, regard the circular form as existing in the transverse section of the gear. Later, it will be seen that where the circle is transferred from the tooth to the cutter, the gear-tooth profiles will still be substantially circular and have the theoretical action.

Fig. 4 illustrates how the involute form can be well approximated by either one or two circular arcs. The larger the radii of these arcs, the greater will be their load capacity. If, however, the radii are such that the arcs closely coincide with involutes, the aim of eliminating all but the helical contact will be defeated by the inevitable form and helix errors. To allow for reasonable errors and to simplify the form the single arc, as at *B*, and of the radius indicated is recommended. In order that contact shall be definitely at the pitch point, all arcs are struck from centers on that line which in involute gears would be the line of action. This line is tangent to the base circle and contains the pitch point.

These arc-tooth helical gears, if errorless, would have pure rolling contact, the contact being always between those points which at any moment were together at the pitch surfaces. Errors would naturally exist, but not to the extent likely where dependence is placed upon the profiles themselves. It is easier to get accurate helices than accurate profiles. To grind the teeth and at the same time to get accurate helices is a simple process. Small form errors would have no appreciable effect on the action.

Gears with tooth arcs proportioned at random might demand accurate adherence to the theoretical centers. It will now be shown that the gears can be equal in respect of center adjustability to ordinary involute gears.

Conceive of a pair of arc profiles so proportioned that, as at *A* in Fig. 5, the radii P and p of the arcs are in the ratio of the pitch radii R and r. Then, since P and p and R and r are in the same straight lines, it can be shown that the two triangles seen are similar. Therefore, Q and q are also in the ratio of the pitch radii. If the centers are extended, as at *B*, with P, p and Q, q remaining the same, and R' and r' being in the same straight line, for they form the line of centers, it follows that the two triangles now seen are also similar and, therefore that $R'/r' = P/p = R/r$. That is to say, the gear ratio has been unchanged by the extension of the cen-

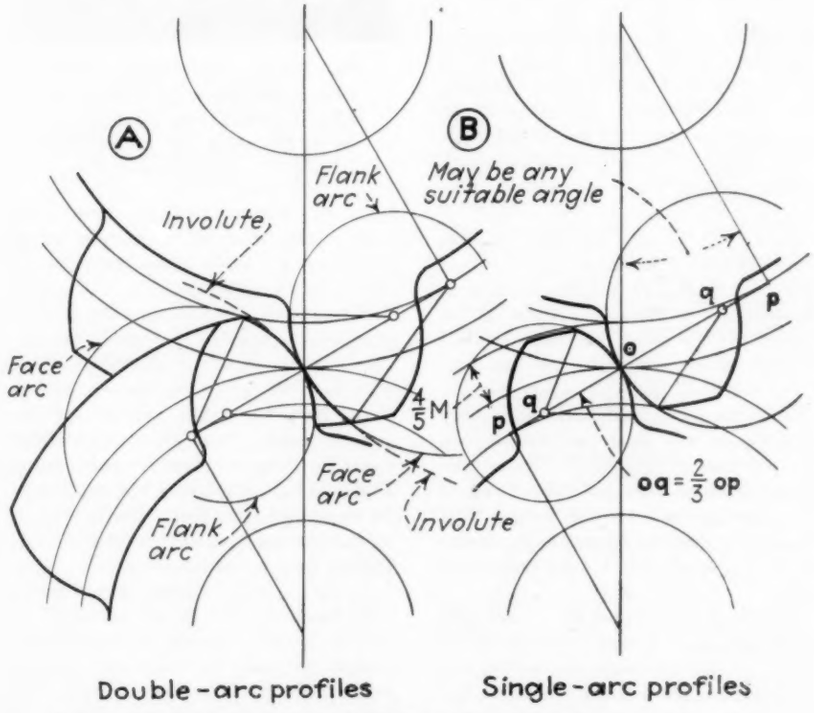


Fig. 4—If the tooth profile lies wholly within the tooth curves the action is as perfect as the helix permits. Errors in tooth profile are minimized by using a single large arc as at B

ters and the contact point is still at the pitch point. So, all that is necessary to assure center adjustability is to make the tooth arcs of radii in the ratio of the pitch radii. Small discrepancies either in the radii of the tooth arcs or in the radial disposition of their centers will immaterially affect the action.

Reference has been made to the advisability of making cutter and wheel forms circular. It will be obvious that if the arc form appear in the cutter, the profiles will be approximately circular in the normal section. This will not affect the theoretical action provided that the cutter or grinding wheel are so set that the profiles make contact on the pitch cylinders.

We have said that the contact is purely rolling. And rolling implies rollers or their equivalent. Where are the rollers and what is their size will be the natural question.

If the gears drive by their pitch helices alone, contact will proceed from tooth-end to tooth-end as the gears rotate. As it is inconceivable that the material of the teeth moves endwise, it follows that endwise sliding cannot occur; and the only alternative to sliding is rolling.

Fig. 6 shows that as any helical gear makes a complete turn, the length of the pitch helix making contact with the mating helix is equal to the pitch circumference of the gear multiplied by the cosecant of its helix angle. Where R (or r) is the radius of the gear, and A its helix angle, the radius of the imaginary helical roller is R (or r) cosec A. Fig. 7 represents the nature of the contact of the pitch helices, the rollers there shown passing from gear tooth-end to gear tooth-end in lines parallel with the axes.

In pure edge gears these rollers would be but disks, they would have no thickness. Where the edges are circular arcs in cross section, the disks would have bellied faces which of course can have but a single contact point. Their diameter is always comparatively large, growing with every reduction of the helix angle.

The question now is: what is the like-

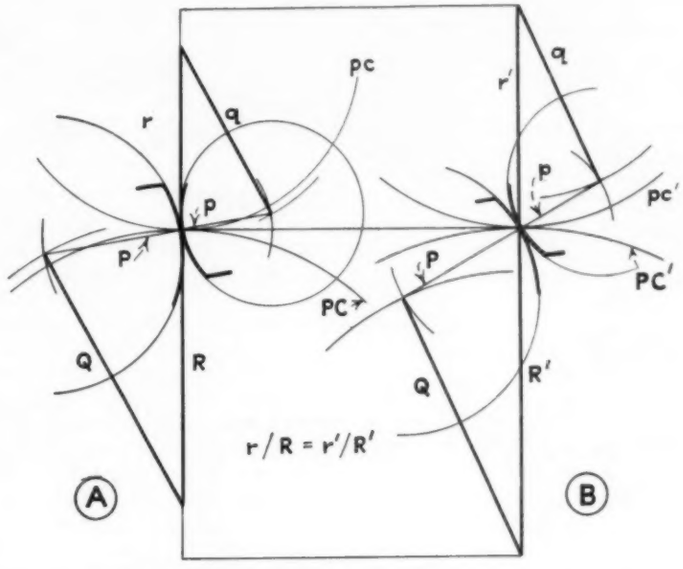


Fig. 5—Centers of helical arc tooth gears are adjustable as with usual involute gears, when the ratio of the radii of the tooth arcs is equal to gear ratio

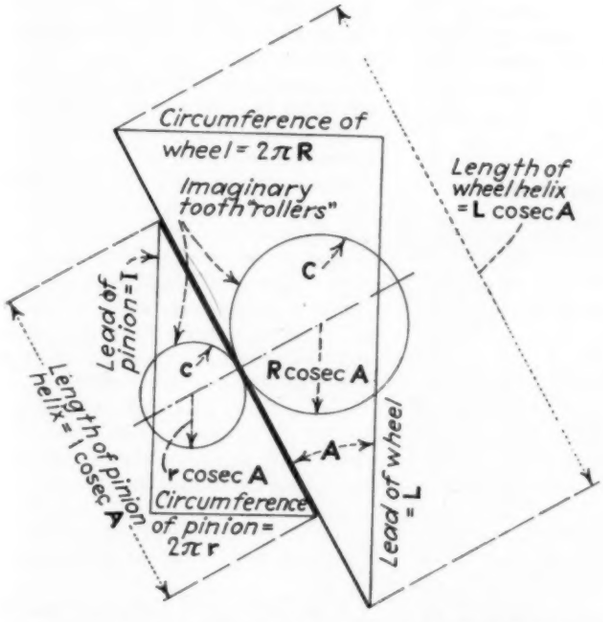


Fig. 6—At each turn the length of the helices rolling together at the pitch points is equal to the circumferences of circles C and c

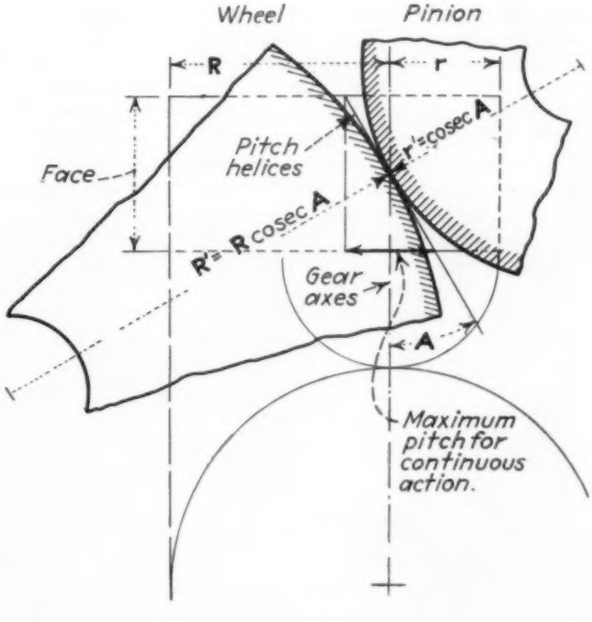


Fig. 7—The effective radii of curvature of the "tooth rollers" are equal to the product of the gear pitch and the cosecant of the helix angle

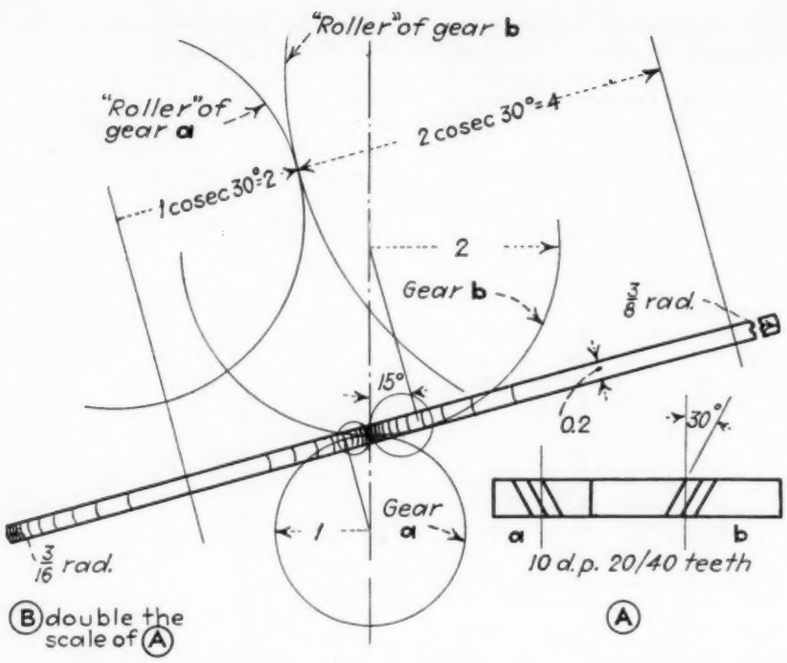


Fig. 8—Rolling friction of this pair of arc-tooth gears is extremely low, as indicated by a calculated power loss of only 0.3 per cent

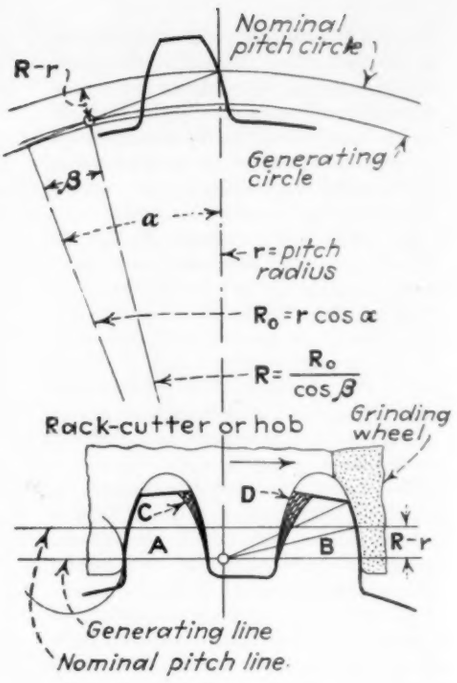


Fig. 9—As the tooth moves from A to B the arc form is gradually produced by the removal of wedge-shaped chips as shown at C

ly load capacity of a pair of rollers bellied in the manner described? This question is difficult to answer with precision, though it is certain that the rollers would be capable of sustaining loads far in excess of any imposed by the apparatus. Some idea of their capacity may be obtained from Fig. 8, representing a pair of rather small gears. Here the action is as between two rollers of the dimensions given. These rollers are visibly capable of bearing any load likely to be imposed on gears so small. Even if the rollers were considered as but equivalent to the balls represented by the dotted circles, balls of ⅜ in. and ¾ in. diameter, they would obviously perform their duty satisfactorily.

Because the action is as purely rolling as can exist between materials subject to plastic deformation, the gears cannot fail to be highly efficient. The efficiency is determinable approximately for any assumed coefficient of friction by the simple expedient of comparing the product of the peripheral velocity of the rollers and the pressure between them with the product of the pitch line velocity and the tangential and normal tooth load.

The velocity v of the rollers, as can be inferred from Fig. 6, is V cosec A, where V is the velocity of the pitch line. If $V = 1$, v clearly $=$ cosec A. The pressure p, normal to the tooth arcs and pitch helices, is P sec B sec A, where P is the tangential tooth load and B the pressure angle.

If f be the coefficient of rolling friction, the power loss d will be

$d = f$ cosec A sec B sec $A = f$ cot A sec B.

Placing f at 0.0015, in the example

$d = 0.0015 \times 1.75 \times 1.035 = 0.0027$.

This deficiency signifies a power loss of less than 0.3 per cent, a figure which is probably but a fifth of that for ordinary involute helical gears.

Can Be Generated

Allusion has been made to cutter "form," from which it might be inferred that the profiles do not lend themselves to production by generating systems. That, however, is not so, as in Fig. 9.

The motion of a rack and a gear as shown will not be uniform if one element controls the other, for all the common normals to the tooth curves pass through the pitch point together, instead of consecutively as is essential to uniformity of motion. A little study reveals that if the rack and the gear are constrained to move as if their pitch surfaces are in slipless contact, the contact between the profiles will exist only when they are in the position shown. As they move from that position they will begin to separate and contact will not occur again until their position has altered by one pitch arc of the gear.

This explanation should enable the reader to see that by the time a tooth had moved from the position A to the position B, the arc form would be gradually produced by the removal of wedge-shaped chips as shown at C. The material at D would be removed earlier in similar chips.

A formed grinding wheel might operate either by true forming as the gear were turned helically past it, or by a generating movement as it moved in the direction of the helix in the manner common to generating systems in which rack-form cutters are employed. Generation would be completed at the instant when the abrasive wheel had rolled, in conjunction with the gear, to the position in which it is shown. At any further rolling, the wheel would recede from the gear tooth profile.

Fig. 9 shows also that generation is not at the engaging or nominal pitch circles, but at circles within these and containing the centers of the tooth arcs. The same figure hints as to the calculations, comparatively simple, necessary for the cutters and to aid the settings of these.

It should not be forgotten that the cutter or wheel forms are reproduced approximately in the normal section and not in the transverse section.

PRODUCTION DIE CASTING

Doehler, whose Toledo plant is probably the world's largest, casts both zinc and aluminum alloys, specializes in high production for high volume users

HERBERT CHASE

TO put die casting production on an efficient basis much more is involved than a battery of die casting machines. Particularly true is this when castings of great variety and size are to be turned out in large quantities.

Where more than one basic metal is handled, different kinds of machines are usually needed. Methods must be provided for handling the metal and for controlling its quality, composition and temperature.

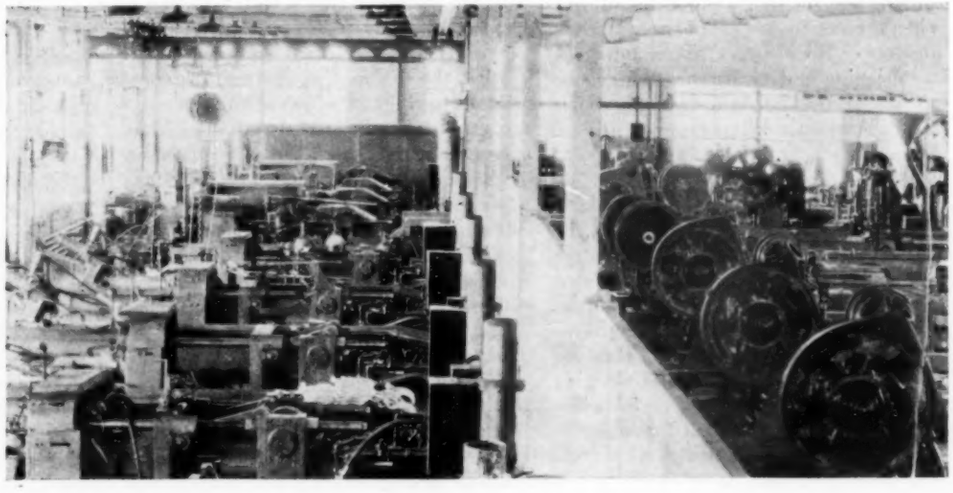
Long experience is required to insure consistently good results in die design and construction. Metallurgists are needed to select die casting alloys, control their processing and to supervise die steels and their heat-treatment.

Probably the largest die casting plant in the world is the Toledo unit of the Doehler Die Casting Company. Some 25 years of experience in this work have made this company a leader in its field. While some of the Toledo plant's operations are duplicated in smaller shops, many of them cannot be attempted where volume or character of the work will not warrant similar set-ups.

Preponderantly devoted to zinc die castings, this plant has also a large department devoted to the production of aluminum alloys. Doehler makes brass die castings, too, and some of lead and tin-base alloys, but these are made at another plant to avoid the chance of lead or tin getting mixed with the zinc. Admixture of these metals in excess of amounts specified by American Society for Testing Materials standards has an adverse affect. Although, according to specification, some aluminum is included in the zinc alloys, aluminum scrap is kept separate and returned to aluminum furnaces. Only virgin metals, including high-purity zinc (99.99 per cent) and scrap, sprues and gates, from zinc castings made in the zinc department, are employed in meltings in the zinc furnaces. This is good practice and provided for in A.S.T.M. and Society of Automotive Engineers specifications.

There are really two departments producing zinc-alloy castings in this plant, one devoted to the general run of zinc-base castings of all sizes and the other to comparatively small castings required in large quantities. Both departments use the same No. 5 alloy which is intermediate between A.S.T.M. Nos. 21 and 23 in copper content (0.75 to 1.25), but has the same aluminum content (3.5 to 4.5), about the same magnesium content (0.02 to 0.05 per cent) and maintains the same low maximum limits on cadmium, tin and lead. This alloy is intermediate also in tensile strength and hardness between the Nos. 21 and 23 and gives an excellent general-purpose alloy suitable for nearly all castings. When either No. 21 or 23 is specified, however, such castings are furnished. Use of a single alloy for the general run of work simplifies procedure in the Toledo plant.

Several types of Doehler machines are used for zinc alloys; the type and size is chosen to fit the piece being cast. All those on the same floor are fed from the same furnaces with molten metal carried to them in a ladle on a monorail conveyor. Although each machine has its own furnace and is fired with automatic control set to maintain a constant metal temperature, the use of molten metal helps to maintain constant temperature conditions, and makes it unnecessary to deliver ingots to the individual machines. Machine operators can thus give their entire time to the casting operation, once the machine is set up. Some machines are fitted with unit dies, any one of which can be changed quickly, when the run with it is completed. Machines are equipped with counters so that operators can easily keep a check



Automobile hardware and other long-run items are the product of this new Doehler department where each die casting machine has its self-contained hydraulic system for die operation. To the right is the cleaning department

on the number of castings produced.

Until recently, castings were placed on benches and then in tote boxes after being taken from machines. Recent installation of a chain conveyor with suitable carriers makes it possible to deliver the castings (with gates) directly to a department where inspection is done and where gates and sprues are broken off. The gates, along with any defective castings, are returned by another chain conveyor to the melting furnaces where they are automatically discharged and weighed before remelting. Perfect castings are placed in small tote boxes which are delivered to the cleaning departments on a roller conveyor.

Grilles Handled Separately

Die cast radiator grilles and other large castings are produced in a separate row of large machines; being bulky and requiring somewhat special cleaning equipment, they are hung on a conveyor which takes them to a separate cleaning department where a bank is kept on hand in a balcony storage space. From here the grilles are delivered to the cleaning racks. Grilles are produced from the same alloys and the machines making them are fed from the same furnaces as the smaller castings.

The general run of castings varies greatly in size and shape from hour to hour so that various set-ups of cleaning tools are required. Different castings are delivered to different groups of machines arranged to clean them properly and economically. In same cases, when the run of a particular casting warrants, certain machines may be regrouped so as to clean the castings to best advantage and with a minimum of handling and the castings passed from machine to machine when more than one cleaning or machining operation is needed. Frequently some hand cleaning may be required, but such cleaning is minimized when feasible by the use of special cleaning tools. As in other shops, much of the cleaning is done by shearing dies in presses or by simple operations which can be done on a drill press or lathe, but for some jobs special tool set-ups are required.

In the department laid out especially for making small castings in large quantities, there are ten high-speed machines in one row, fed from two melting furnaces. These machines make, as a rule, from 400 to 500 shots an hour and usually have multiple-cavity dies. Half the shop is devoted to a special cleaning department; there is a short cleaning line with a short conveyor belt for each die-casting machine. As castings come from the machines, they are plunged into a cooling solution and pushed along a bench direct to the cleaners, the first of whom in each line inspects the castings, breaks off sprues and gates, and passes the castings to the next operator in the line or onto a belt which carries them to that operator. The first operator in some cases performs the initial cleaning operation, and other operations, when required, are done on other machines along the short line. At the end of each short line is an inspector, usually a girl, who removes, examines and packs the castings as they reach her on the belt. So rapidly are the castings handled that they are often still warm when packed. Some machines with eight cavities deliver over 3,000 castings an hour. Though this is an excellent set-up, it is not adaptable except in a shop where there are many high-production items requiring few and simple cleaning operations going through continuously, and there are few if any other die-casting shops in which this condition exists. Parts produced in this department are largely automobile hardware, barrel plugs and similar items purchased in large quantities by a comparatively small number of companies with which the required arrangements can be made.

All machines used with zinc have pneumatically operated metal plungers giving comparatively high pressures which are known to produce excellent castings. In many cases, the finish of surfaces to be plated is so smooth that only a light buffing and cleaning is required prior to plating. Thin sections are produced when conditions are favorable and the design calls for them. Grilles and comparable large castings can be produced at around 50 an hour. Smaller castings are made at a much higher rate.

In the department for aluminum die castings, gooseneck machines using high-pressure air for injection are used as the alloys do not permit of using a metal plunger. Alloy-steel dies which require heat-treatment are needed to resist the higher temperature (as compared to zinc) at which aluminum casting must be done; they are somewhat more expensive than the softer die used with zinc, but the alloy steel used has been developed to such a point that often 100,000 casts can be made before dies require replacement. The machines used are somewhat larger than most of those in the zinc die casting department and accommodate larger dies which are often made with multiple cavities especially for large production.

In most cases, metal is fed to the machines from separate melting furnaces, using one of the two standard alloys, but when alloys other than these are specified, melting is done at the machine. The standard alloys most used are A.S.T.M. No. VII (S.A.E. 307) and A.S.T.M. No. XII (S.A.E. 312). Of these, the former contains 5 per cent silicon and 4 per cent copper, and the latter 7 per cent copper and 3 per cent silicon. No. VII has good casting properties, fair ductility and fair corrosion resistance; No. XII is a low-cost general-purpose alloy of high tensile strength and high yield point but is low in impact strength and elongation.

Only a few of the aluminum die castings produced are for automotive applications, but most of these are produced in large quantities, among them being small aluminum pistons for hydraulic brake applications. These parts are made in five sizes in multiple-cavity dies which turn out 1,500 pistons an hour. They are chamfered and faced in a simple drill-press operation at the rate of 3,000 an hour, using a dial fixture which is loaded by hand. The purchaser subsequently grinds these pistons on a centerless grinder, holding them within close limits. Aluminum is used in this application because of its corrosion resistance in the hydraulic brake fluid and its dimensional permanence. Other aluminum automotive die castings produced include end plates for the lighting generator used on Ford cars. Some dimensions on diameters machined on these castings are held within 0.0015 in. of nominal size and the castings are produced complete at the rate of 2,000 sets in eight hours.

Aluminum Parts Polished

Many larger aluminum die castings are produced in this department, especially for portable equipment and household appliances in which the light weight of the aluminum alloys is an advantage. These alloys are also used for parts which are to be polished without plating, as aluminum holds such a polish for long periods. Some aluminum die castings are also given an anodic finish which is hard and enduring and can be dyed in attractive colors, though the treatment is not done at the Doehler plant. When this treatment is to be applied, an alloy containing 1.5 per cent copper, 1.5 per cent nickel and 1 per cent silicon is used.

Cleaning of fins from aluminum die castings is done in a department separate from that in which the zinc castings are handled and the trimmings, including, of course, sprues and gates, are kept separate from those of the zinc alloys. The aluminum department is a separate portion of the building.

DIE DESIGN *and* DIE MAKING

E. G. MARSHALL
Master Mechanic, Charleston Works, The American Fork & Hoe Company

XII—Clean stampings and reduced die wear result from properly constructed dies for forming right angles, obtuse angles and sharp-cornered right angles

THAT it is no mean task to get the forms right in formed work was shown in Part XI (*AM*—Vol. 80, page 733). Instructions were given in connection with right-angle forming jobs on how to grind the die members in order to correct certain faults. It is true that more information of the same sort is added in the following material, but the emphasis is laid on the type of job and construction of the dies.

Forming edges of form dies are subject to considerable wear, especially in the high-production type. To overcome this condition rollers can be substituted for solid forming edges, and when worn, new ones can easily be inserted. Standard hardened and ground dowel pins make suitable rollers. An example of their use is shown in Fig. 54, illustrating a high production die for bending up each end of a straight link. Since the introduction of the rollers requires different construction than that shown for Fig. 50 (*AM*—Vol. 80, page 734) the machining of the die will be described in detail.

Die block *A* is made of water-hardening, wear-resisting tool steel, and is to be hardened and ground. First, it is machined out in the center for the movable member, the side walls of the hole being left straight. The width is made great enough for the knock-out pins and to give room for the nest plates. The length of the opening should be 0.005 in. less on each end than the outside to outside dimensions of the finished part.

Sockets are used to receive the inserts for the rollers. A hole is drilled in each end of the die block to take an adjusting setscrew. Care must be taken not to use a screw that is too small because the forming pressure will cause it to break and work loose. A clearance hole is drilled through the die block for the screw that holds the insert down. After screw and dowel holes for attaching the die block to the sub press are put in, the die block is ready to harden.

When the designer decides on the thickness of the die block he should consider the following points. The center of the roller is actually the working

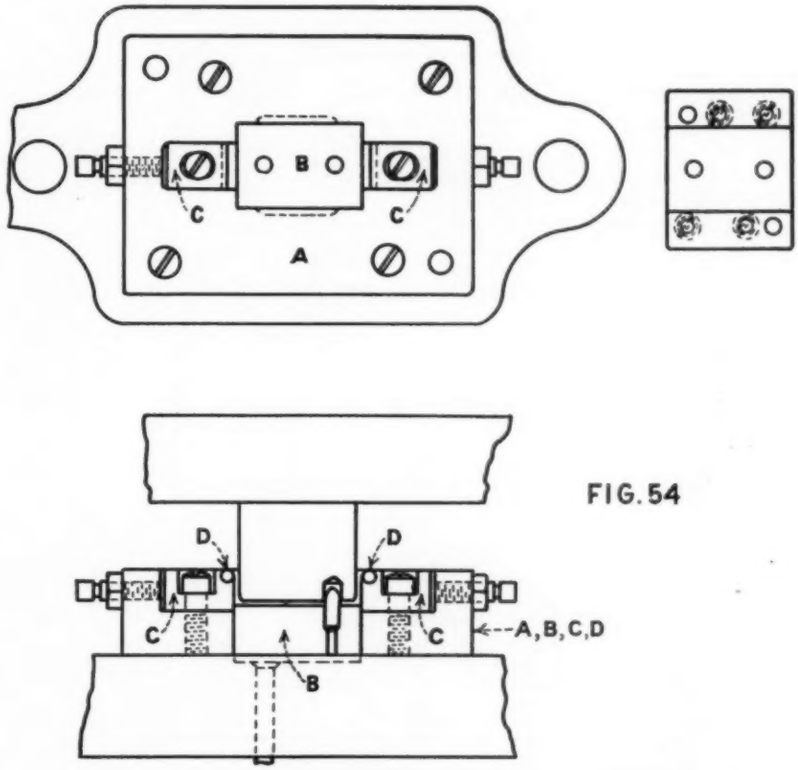


FIG. 54

Fig. 54—Rollers D *in the forming edges of the die block absorb the wear and can be quickly and cheaply replaced*

point in the die block. If there is a radius on the end of the punch, the distance from the center of this radius to the center of the roller should never be less than four times the stock thickness. The depth of the die block should leave room for a thick strong movable member with ample guidance in the down position.

The movable member *B* is machined to a snug sliding fit in the die block. It is made of wear-resisting, water-hardening tool steel and hardened and ground. A retaining plate is attached to the bottom. After the locating pin holes are bored, or holes for nest plates drilled, tapped and reamed, the movable member can be hardened.

The inserts are rough machined larger than the finished size so that the bearing hole for the roller can be bored and reamed. The front edge and top edge of the inserts are finished so that the roller will be 0.005 in. higher on top and extend 0.005 in. in front of the working end. After drilling and counterboring the clamping screw hole, it is elongated to give the insert about ⅛ in. of travel. The block is then hardened. The roller hole should be lapped smooth and the roller fitted.

After the knockout-pin holes are drilled and the pins put in, the movable member, the die block and the inserts can be assembled and mounted on the lower member.

The punch is made of water-hardening tool steel. A heel is left on the sides for attaching it to the upper member. Whereas the width should be the same as for the movable member, the length should be slightly longer than the inside of the finished part. This allows for grinding after a tryout. It may also be necessary to grind an overthrow angle on the ends of the punch. The

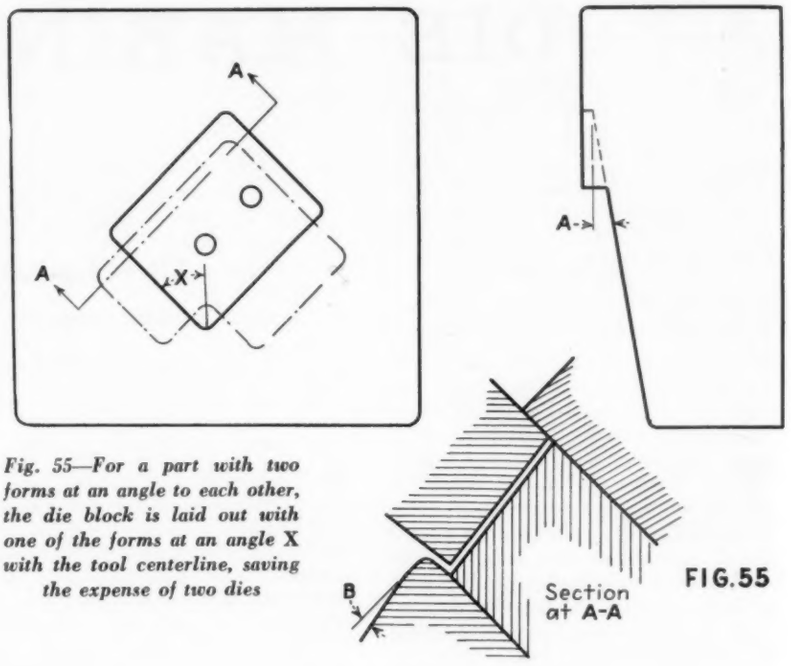


FIG.55

Fig. 55—For a part with two forms at an angle to each other, the die block is laid out with one of the forms at an angle X with the tool centerline, saving the expense of two dies

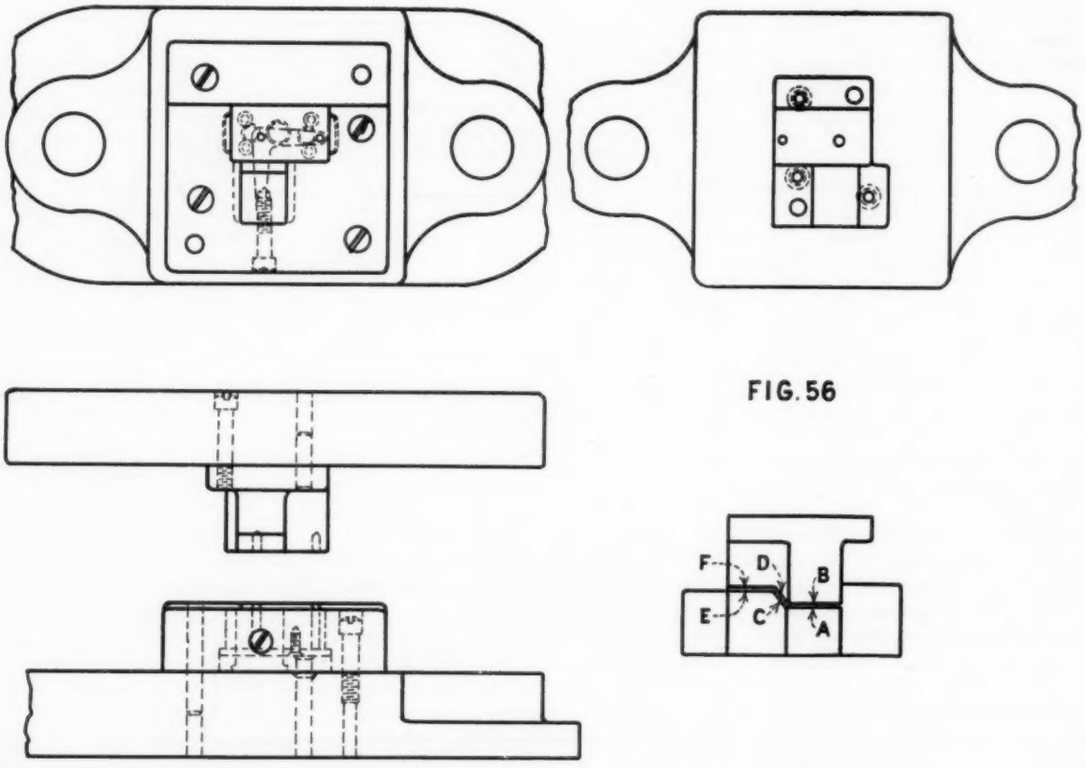


FIG.56

Fig. 56—When two obtuse bends are close together it is customary to make them in one die, and to leave the die flat

two knockout pins eject the part if it clings to the punch after forming.

When a part has two right angle forms projecting from the same side of the blank, it is laid out at an angle to the center line of the tool. Fig. 55 shows a part in which the two forms are at right angles to each other. To avoid making two dies, each to be tilted to iron the form, the part is laid out at 45 deg. from the centerline of the tool. The top of the die is tilted to a 10 deg. angle. This is an approximate angle of 7 deg. at both of the forming points. When the angle between the forms is not 90 deg. the part can be laid out by making use of the following

$$\sin X = \frac{\sin A}{\cos 90 \text{ deg.} - X}$$

In this case X is the angle of the form from the centerline of the die block. Angle A is the angle at which the top of the die block is tilted along the centerline. Angle B is the approximate angle of the form and the top of the die block along the line AA.

Two obtuse forms are made in the die shown in Fig. 56. The part is located on top of the movable member with locating pins. Unless the blank covers enough of the movable member to balance it, equalizer nest plates, buttons, or a machined shoulder should be used. If the punch hits a blank that lies on only one of the movable members, it will cock the member and in time something will break. At least, a lot of extra wear will be caused.

This die has an insert to make the first adjustment easy as well as to facilitate repairs. After machining and assembling the die for tryout, errors may be corrected as follows:

If a formed end is not parallel with the main section on the movable member it may be caused by the following conditions:

1. By the die bottoming at A or E and not at C or D. To correct, grind the surfaces hitting the hardest until all surfaces hit evenly.

2. The condition may be caused by the angle of C and D with the movable member, preventing or not allowing for spring back. It is assumed that all surfaces are ironed out. To correct, grind the punch at B and at the upper part of D tapering to nothing at the lower part of D. Grind the die at E and the bottom of C near the movable member, tapering to nothing at the top of C. Keep all surfaces bottoming or pinching evenly.

3. The condition may be caused by one angle being off.

If the forms are too close to the locating holes, grind the punch at B and the die at E and C. Inversely, if the forms are too far away grind the die at E and the punch at D and F. In the case of a part with half a dozen forms, make a layout on paper, cut out and form by hand. This procedure will save trouble in figuring the sequence of operations.

To form a part back over itself usually requires some type of cam-operated die. Fig. 57 shows a second-operation die for putting a second form in the part at X. This part is made from 1/16-in. cold-rolled steel and has been blanked, pierced and the sides formed up at right angles. The second operation to be performed consists of forming the part back over itself with a 1/16 in. gap between.

In this die the part is located over two pins with the leg for X sticking up. The front hand lever shoves a bar over the top of the part and the cam-operated slide working from the left forms the part over and down on bar. As the cam moves back out of the way, the punch flattens the top of the form to be parallel with the bottom.

The die block A is mounted on the lower member with screws and dowels. It is made of tool steel, because the top surface must stand the wear of forming. The locating pins are a drive fit in the block. On the top is mounted the guide block B that backs up the hand lever slide. The guide block B is likewise made of tool steel. A shoulder on one

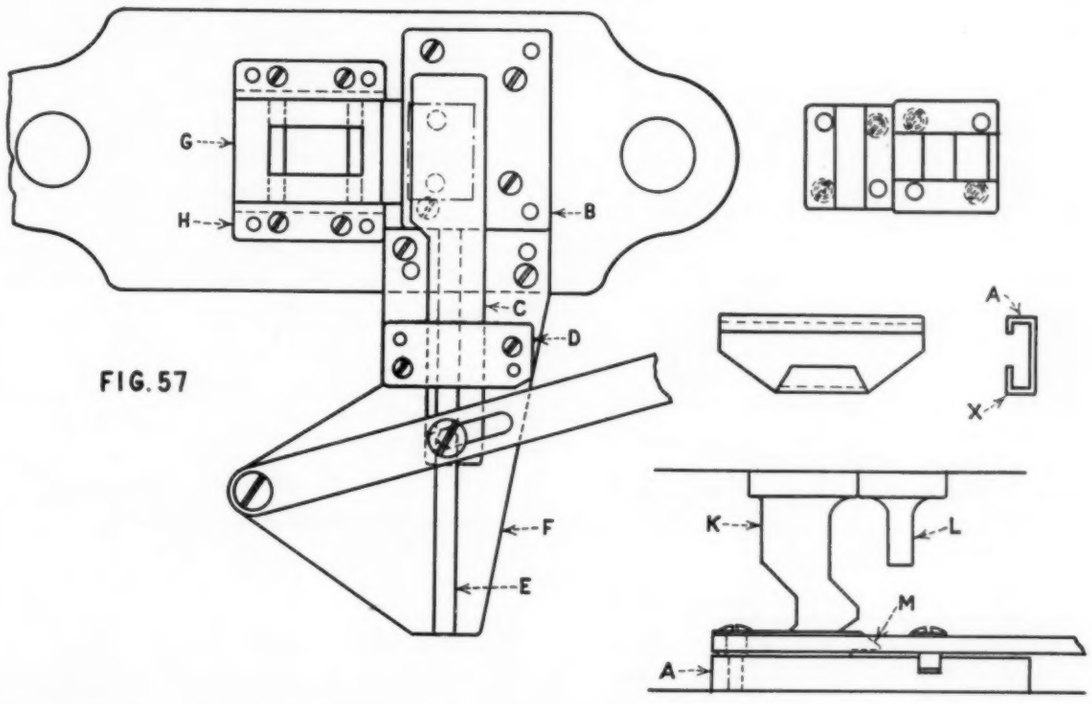


FIG. 57

Fig. 57—Bend X is made in a second-operation die. It is obtained by starting the form with the cam-operated slide machined to suit as at M, *and then flattening with the punch* L

side holds the hand lever slide down and also backs it up when forming the part. Both the die block and the guide block are hardened and ground.

Hand lever slide *C* is made of tool steel and hardened and ground. The right side fits against the back-up block under the shoulder. The left side is ground down to suit the inside dimension of the part. And the left edge is ground to the correct distance from the locating pins after assembly. The hand lever slide is also guided by the hardened plate *D* and by the key *E*. It is mounted on the plate *F* on the front of the sub press.

On the left side of the sub press is the cam-operated slide *G* held in the guides *H*. All three are made of tool steel, hardened and ground. The front end of the slide is machined to fold the part down over the slide *C*. A hole in the center provides clearance for the cam and a roller mounted in the slide takes wear.

Cam *K* attached to the upper member is made of tool steel, hardened and ground. The cam surface is machined to hold the slide back in the loading position, but when the ram moves down it moves the slide forward to form the part and then moves it back to clear the punch *L* in its downward stroke.

Punch *L* is made of tool steel, hardened and ground. It is screwed and doweled to the upper member. The bottom end is ground flat to iron out the top form of the part parallel with the bottom.

Both forming and swaging are done in the die shown in Fig. 58. The part is a long narrow strip of cold-rolled steel 1/16 in. thick. It is formed up at one end and the outside of the corner must have a sharp corner. The die operates as follows: the part is located endwise by the shoulders on the movable member. It is located front and back also by the sections of this movable member. The punch on the upper member is also movable, being held by springs which are stronger than those in the lower member. As the punch moves down and contacts the part, the lower member yields and the part is formed up in a slot in the die-block insert. When the lower movable member bottoms, the upper punch yields and moves back. Since the upper blade is rigid and supported, the formed end is forced back and filled out to a sharp corner.

The die block is made of tool steel and in two sections *A* and *B*. Section *A* is screwed and doweled to the lower member, while *B* is screwed to the lower member and clamped to *A* by the screws shown. The die block is made in sections for easier machining and for grinding to take up wear.

Insert *C* is held in section *A* by a heel at the bottom and a screw. High-chrome vanadium tool steel is used for the insert, which is hardened and ground all over. The slot on the working face is the width of the part, and the depth is the thickness. The movable member fills this slot to back up the part.

Four parts, *D*, *E*, *F* and *I* make up the movable member. The center piece *F* is made as wide as the part. One end fills the slot in the insert. The top of this piece *F* lies below *D* and *E* by the thickness of the stock.

Sections *J* and *K* in the upper die block are made the same as the sections *A* and *B* in the lower die block, and their purpose is to guide the upper member or punch. This punch is made in two sections, *L* and *M*. The width and length of *L* are made to fit the opening in the lower die block. The height is such that the upper die block does not come within 1/8 in. of contact with the lower block when in operation. Section *M* is attached to section *L* with flat-head screws. Both parts are made of tool steel, hardened and ground.

Blade punch *N* is mounted in the cold-rolled punch plate *O*. It is a snug fit between the die block and the punch. The working end is supported by the lower insert when it contacts the part. Care must be used in hardening the punch to prevent brittleness or softness.

Part XIII of *Die Design and Die Making* will appear in an early number.

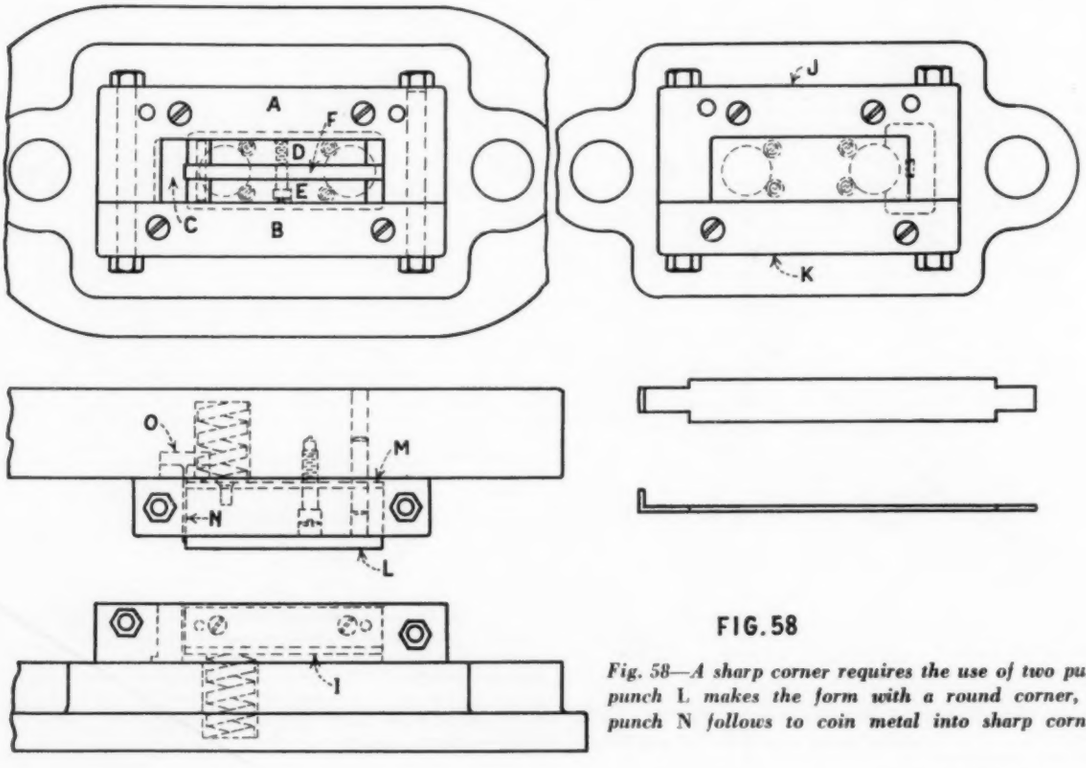


FIG. 58

Fig. 58—A sharp corner requires the use of two punches. Yieldable punch L *makes the form with a round corner, and rigid blade punch* N *follows to coin metal into sharp corner of die insert*

Editorials

AMERICAN MACHINIST ESTABLISHED 1877
VOLUME 80 NUMBER 19
K. H. CONDIT • F. H. COLVIN
EDITORS

"IN TIME OF PEACE—"

POSSIBLY the next world conflagration is not so imminent as the portentous words of the military dictators would lead us to believe. Perhaps, if the conflagration breaks out, we may be able to maintain neutrality. But it will not do to place too much money on either bet.

As one of the few remaining oases of democracy and personal liberty left in the desert of absolutism, this country may have to fight, if it wants to remain free of Communism on the one hand or Fascism on the other. Nobody in the United States wants to get into another war, but that is no reason why we should do anything that will jeopardize our chances of victory if we cannot keep out.

The proposal to nationalize all munition manufacture would be about as sure a way of committing national suicide as could be devised. Every one in the military establishment, and any one who has any conception of the intricacies of modern military weapons, knows that government arsenals cannot possibly produce the munitions we would need for a major struggle. Private industry must undertake the major part of that job, and must be in a position to undertake it immediately if the call comes.

Major General Tschappat, Chief of Ordnance, sums up the attitude of the War Department thus:". . . the War Department does not favor the nationalization of munitions manufacture; that is, the full manufacture in government establishments. Such a policy would fail in war and therefore does not appear logical in peace." He gives the reasons for this attitude in an article in the current *Army Ordnance*.

Arsenals, of course, are the experimental laboratories of the defense arm of the government. It is their job to develop new means of defense, and to train personnel in their production. Most of them today are barely well enough equipped to do the very limited job assigned to them in peace times. In an emergency there would be no chance of expanding them to meet the needs, because machine tools cannot be produced overnight.

VERY fortunately, despite our abhorrence of war, we have carried on since 1918 a study of industrial mobilization that puts us in a much better position than the one that faced us in 1917. The job to be done in an emergency by the metal-working industry will be a staggering one, but whatever advance planning we do now will make it that much easier.

We fought the World War to end wars, but only the most stupid among us will deny that the old admonition, "In time of peace prepare for war," still holds.

No Training

FAILURES of the New Deal have been many and their consequences will curse us for years to come. Of these failures few seem quite so needless as the failure to take steps to help in the training of the great proportion of unskilled in the army of the unemployed. Some experts place this proportion as high as seventy-eight per cent.

It is hard to understand why an administration that has protested so loudly its love for the forgotten man, and its great social achievements, should have been so blind to a condition that is acute now, and was foreshadowed two years ago. A Chicago correspondent writes us that there seem to be at least three jobs in that area for every qualified machinist. Men in other industrial regions tell the same tale of opportunities for skilled men. Yet the administration, except for its tiny effort through the Federal Committee for Apprentice Training, is doing little to save the situation.

Apprentice training is vitally necessary, and much more of it should be done than is being done, but it is only one approach to the problem. We must train the youngsters, yes, but we must also devise ways to impart skills to the older workers who can still be taught. Industry changes constantly. New products demand new trades, and replace old products and the old trades that fade with them. Some of the older men in the dying trades cannot be retrained for other useful work, but the great majority of the younger ones can be taught new skills, and the mass of unskilled is a fertile field for recruits.

Chips

WASHINGTON—Navy Department apportions contracts for 15 new destroyers and submarines among private builders and Navy Yards . . . War Department allots 12 millions for flood control . . . Roosevelt sends up trial balloon to see how public would react to peace conference of world political heads, upsets diplomats . . . Secretary of War Dern dies in Washington . . . Secretary Hull warns Americans to leave Spain at once as he is considering withdrawing warships to prevent dangerous "incidents" . . . U. S. to retain 40,000 tons of overage destroyers to balance Great Britain's similar move and Japan's increase in submarine tonnage.

FOREIGN—Saber rattling continues vigorously in Europe as Hitler orders compulsory military training program extended from one to two years, Stalin tells his armies to be ready for action, Mussolini warns of war and boasts of his 8,000,000 men, French Socialists wonder how to strengthen defenses, and Spain's civil war continues viciously . . . Deliveries on some types of machine tools have lengthened to two years in England . . . Japanese official suggests need for revision of 9-power treaty . . . Schacht tells French they need have no fear of Germany as he negotiates for loan . . . Norway interns Trotzky, ousts aides . . . Reich raises corporation taxes . . . Roumanian Fascists gain control, likely to line up with Nazis.

FINANCE—Bethlehem Steel files for $55,000,000 bond issue with SEC, $40,000,000 for new plants and modernization of equipment . . . SEC clamps down on stock trading by its own employees . . . August dividends up as companies act to avoid penalties of surplus tax levy . . . Roosevelt sets new budget deficit estimate at two billions which reflects effect of AAA failure and bonus load . . . Treasury to keep billion in cash.

INDUSTRY—Employment up 1,000,000 from July 1935 according to Labor Department figures, payrolls up $42,000,000 . . . Packard announces expenditure of five million for new equipment and plant rearrangement mostly in connection with manufacture of new small six . . . Blaw-Knox and subsidiaries will grant vacations with pay to all employees paid on an hourly basis . . . Kelly-Springfield closes Cumberland plant because of "inadequate police protection" . . . General Motors to build five million dollar assembly plant for Buick, Olds, Pontiac at Linden, N. J. . . . G. E. is working on a new type of steam-electric locomotive for U. P. . . . Willys-Overland reorganization approved, plans to build 70,000 cars and employ 5,000 men announced . . . Cotton-picking machine picks plenty of cotton but gets a fair share of dirt and leaves as well . . . Manchester men unite to take over Amoskeag Mills . . . Pillsbury flour mill in Minneapolis closed by strike . . . National Tube reconditioning 6 open hearths at Lorain that have been closed for years . . . Johnson and Outboard Motors to merge.

TRADE—July foreign trade higher than a year ago, balance against U. S.

INDICATORS—Steel production maintained at better than 70 per cent of capacity . . . Electric power output reaches new high . . . Business Week's index off a fraction to 77.5.

World Trade In 1935 Registered Recovery

First Annual Gain Since 1929 Is Shown in Geneva Figures

In 1935 the value of world trade improved slightly over 1934, the first such annual rise since 1929, according to the League of Nations' annual review of world trade just published. The volume increased more than 4 per cent over 1934 but was 18 per cent below 1929. It was greater in foodstuffs, raw materials and manufactured articles, especially machinery and other capital goods.

The United States, the United Kingdom, Germany and Japan increased their share of world exports in 1935, while French exports fell sharply. The value of Europe's trade dropped 2 per cent, while that of all other continents combined rose 6 per cent.

The United States contributed 10.79 per cent to world trade, against 15.84 in 1929, while Japan's share rose from 2.86 to 3.53 per cent. Italy fell from sixth place to fourteenth.

Industrial Production In July Continued High

Three-Month Level Was Maintained, Reserve Board Says in Bulletin

Contrary to the usual decline in July, industrial production was maintained at the level of the three preceding months and factory payrolls increase, the Federal Reserve Board announced in its business review.

Commodity prices continued to advance. Money rates remained at extremely low levels.

The board's seasonally adjusted index advanced to 108 per cent of the 1923-1925 average as compared with 103 per cent in June.

Evans Making Auto Transmission Unit

Vacuum Transmission Is Developed By Detroit Company

Evans Products Co., Detroit, has started production of a new "autoshift," a vacuum-operated transmission for passenger cars and trucks. The unit is self-contained and control is by a finger lever mounted on the steering column below the wheel. Gear shifting is pre-selective and noiseless, being accomplished without use of electricity. W. W. Mohun, vice-president, is in charge of the new division. E. G. Hill, co-inventor of the device, is in charge of engineering.

—As It Was in 1838—

Notice

OWING to the deranged state of the currency the *Collins Mfg. Co.* cannot do business as heretofore and have decided to reduce for the present in the following manner, viz:

To discharge immediately all those who have been paid recently, and have not entered their names for another quarter, then to pay the rest and discharge them as fast as each man's quarter expires, which will shut down the gates by the 1st of July, and we do not purpose to raise them again before the 1st of September. We intend when that time arrives to start once more, and employ all those who see fit to return, or if they should not return before late in the fall I think it will not make any difference—Those who do return may be sure of employment through the winter whether business revives or not and longer of course if business will warrant it—Those who are thus discharged and have families need not remove them unless they prefer it, but remain where they are without paying house rent from the time they are discharged until the company resumes business again—I cannot close this notice without expressing my extreme regret and mortification that we are obliged thus to disappoint the reasonable expectations of so many nor can I refrain from throwing the blame where I think it belongs—viz: on our *National Government.* I seldom say much about *politics* but on this occasion must remark, that I hold it to be the duty of every citizen to go to the polls and vote conscientiously* and having done so, submit quietly to the decision of the majority and to the laws enacted by them—I am moreover disposed to sustain without *quibbling* the measures of those placed in authority over us unless they are clearly *Vicious—Tyrannical—* and *Oppressive*—of this character I deem the late *acts* of our *General Government* and were it a Monarchy I would appeal to the *Sword.* As it is a representative government, I appeal to common sense and the ballot box—

Collinsville, April 5, 1838

(This is a true copy of the Notice written by Samuel W. Collins and posted in the Plant of the Collins Mfg. Co., April 5, 1838.)

***That is, vote the Whig ticket.**

Machinery Has Big Role At World Power Session

3,000 Delegates Represents All Nations As Conference Begins

The Third World Power Conference, with more than 3,000 delegates representing practically every nation in the world in attendance, opened Sept. 7 in Washington.

Canada, Argentina and Mexico have joined with the United States as hosts of the conference, which will be the greatest and most representative gathering of power engineers and manufacturing experts ever held in the Americas.

Every industry involved in the generation of power, its distribution and the manufacture or placement of power machinery and equipment throughout the world will be represented in the discussions at the conference. Governmental ownership or operation, or both, will be a high light of the power discussions.

An interesting schedule of visits to manufacturing plants throughout the country has been arranged.

New Willys-Overland Plans Are Shaping Up

President Is Retooling Plant for Nov. 5 Production

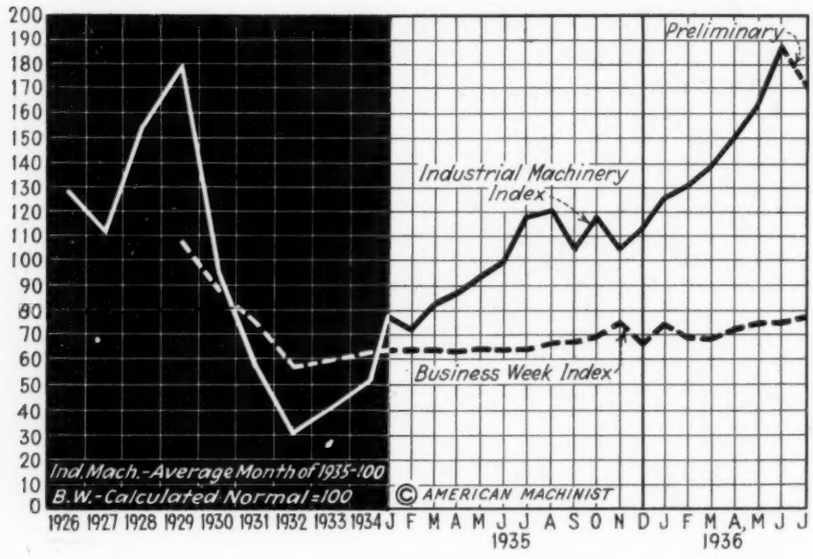
The new Willys-Overland Motors, Inc., is shaping its plans to take over operating property at the Willys-Overland plant in Toledo and Los Angeles on Oct. 1. Legal work, stock subscriptions and other details of the property transfer are scheduled to be completed by that time. David R. Wilson, president of the new company, who also is trustee under the court, is rapidly retooling the plant.

DEALERS WILL MEET AT GRANVILLE, OHIO

Norton Booz, Federal Machinery Sales Co., and president of the Associated Machine Tool Dealers, has called a meeting of that organization at the Granville Inn., Granville, Ohio, Sept. 21 and 22.

HURD IS EXPANDING

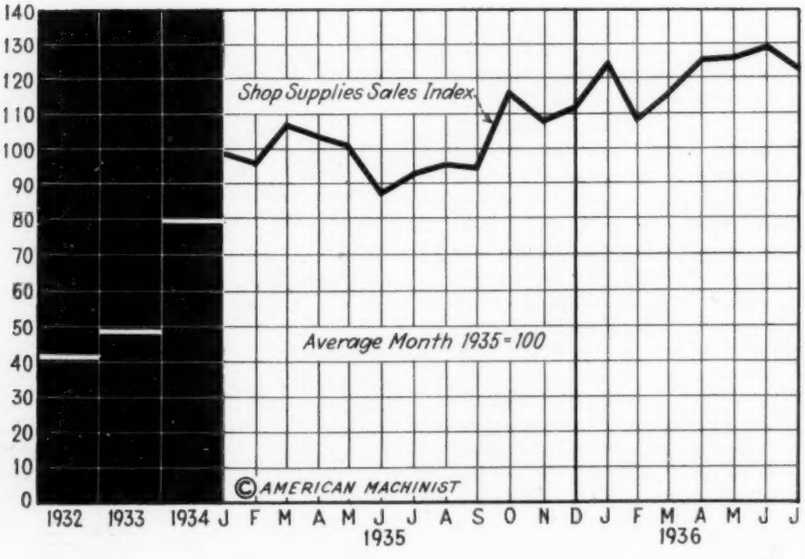
Hurd Lock & Mfg. Co., Almont, Mich., has bought the former plant of the Adrian Knitted Products Co., Adrian, Mich., which is now being remodeled and will be in production within 60 days on locks, hub caps, tumbler pin cylinders and accessories.


Preliminary
Industrial Machinery Index
Business Week Index
Ind. Mach.-Average Month of 1935-100
B.W.-Calculated Normal=100
© AMERICAN MACHINIST
1926 1927 1928 1929 1930 1931 1932 1933 1934 J F M A M J J A S O N D J F M A M J J
1935
1936

Orders for Industrial Machinery

June's preliminary figure for the Industrial Machinery Orders Index was lifted over 40 points by an entirely abnormal order for special electric motors, when the final figure was calculated. If this order had not been included the curve would have shown a continuation of the steady upward march of the last few months instead of the drop indicated. Indications are that the August level will at least equal, and may exceed the July figure.

Business Week's **Index plotted against the Machinery Index, continues the even tenor of its upward way, and by contrast is far more steady than the latter curve.**



Sales of Shop Supplies

A seasonal recession in the grinding wheel index, most heavily weighted item in the Shop Supply Sales Index, brought down the preliminary estimate for July below the June level. Here, too, every indicator points to an early resumption of the upward trend.

General Motors Plans Big Linden, N.J., Plant

$5,575,000 Assembly Factory Will Employ 2,000

General Motors Corp., will build one of the largest automobile assembly plants in the world on an eighty-acre site at Linden, N. J.

The plant, when equipped for maximum operation, will represent an outlay of approximately $5,575,000. It will have a normal capacity of 120,000 cars a year. Approximately 2,000 persons will be employed when the plant is operating at full capacity.

The factory will assemble Buick, Oldsmobile and Pontiac cars for delivery to the East Coast region and overseas. Two-thirds of the production is scheduled for domestic delivery and one-third is for export.

Construction will begin in about a week, with completion scheduled for December. Contracts for materials and building are being allotted in Detroit.

The plant will include four buildings, the main factory, an office building, a loading dock and a power house, and an oval test track almost half a mile in circumference.

W. S. Roberts of Detroit will be general manager of the new division. Albert Kahn of Detroit is the architect.

The present decentralization move is in line with the policy of decentralization of industry wherever economically practical as advocated by Alfred P. Sloan Jr., president of General Motors, in recent public statements, according to the company.

Packard Is Doubling Capacity of Factory

$5,100,000 Is Part of $18,000,000 Improvement Program

Anticipating a production in the next twelve months which will far exceed that of any year in its history, Packard Motor Car Co. is more than doubling the productive capacity of its plant to cost over $5,100,000, M. M. Gilman, vice-president and general manager said.

Present expansion activities, he said, mark the completion of a general development and manufacturing expansion program on which Packard will have expended $18,000,000.

A completely new iron foundry to be the most modern in existence, and new machines, and equipment are being installed to give maximum efficiency.

Watching Washington

Two leading presidential candidates meet at Des Moines... Roosevelt in radio talk defends spending... Next Congress to be busy with expiring legislation... Walsh-Healey act clarified

WASHINGTON—For the first time since 1912, when President William H. Taft met Governor Woodrow Wilson in Boston, two presidential candidates greeted each other in the midst of a political campaign. In the office of Iowa's Governor Herring, President Roosevelt and Governor Landon clasped hands and talked drought relief. Staged as a non-political meeting, the encounter was not without its dramatic moments as the two aspirants to the next term at the White House sought ways to promote "dust-bowl" farmers' welfare.

Results of the Roosevelt journey to the plains were given to the nation in another of the President's "non-political" fireside chats. The talk was a defense of federal policy and plans pertaining to farm relief. Not to leave city dwellers out of consideration the President seized upon the imminence of Labor Day as reason enough to include the subject of unemployment and to announce the allocation of an additional $2,500,000 to the U. S. Employment Service. Even business came in for a share of conciliating remarks with observations as to the importance of private enterprise in promoting reemployment.

Vital Legislation Due

Regardless of the election outcome next Congress, convening January 5, will have much vital legislation to enact. Some of this will be caused by the expiration of existing laws which will need revision or repassage if they are not to lapse. In most instances the complexion of these statutes will be influenced greatly by the occupant of the White House.

For example, there is the President's monetary power, which expires January 30. This provides unlimited coinage of gold and silver, power of the Chief Executive to vary the gold basis of the dollar between 50 and 60 cents on the old standard, and the exchange stabilization fund. March 3 ends the Federal Reserve Bank's authority to issue reserve notes with collateral security in the form of U. S. obligations.

Civilian Conservation Corps appropriations extend only to March 31; to date $1,250,000,000 has been expended on this activity. On April 1, F. H. A. modernization loans for new housing will terminate. Statutory authority for the Electric Home and Farm authority to finance electrical appliance sales ends February 1.

A whole list of excise taxes will terminate during the first seven months of 1937; from these sources $300,000,000 was realized during the last fiscal year. On June 12 next the President's power to enter into reciprocal trade agreements with foreign countries comes to a close. So far fourteen such pacts have been concluded.

On May 1, the neutrality act expires; this now applies only in the event of war between two foreign nations. The "hot-oil" law terminates in June. Originally part of NIRA, this legislation was reenacted after the Supreme Court's decision voided the Recovery Act. Unless there is prior legislation the three-cent letter postage ends July 1.

Other dying statutes will command Congressional consideration, but of all these, perhaps none is so vital to American business as the opportunity offered to rework the tax plan. Official statements on taxation are misleading insofar as they create the impression that next year's revenue legislation will be perfunctory and of minor importance.

Given the same volume of business, existing law will raise more revenue than at any previous time, but it is too much to ask Congress to reopen the tax question without making many changes. The new act was thrown together under great pressure. Its administrative provisions must be thoroughly overhauled. Elimination of taxes that cost too much to collect will not be accomplished without extensive debate.

While there is little prospect of repealing the taxes on undistributed earnings, such glaring injustices have already been revealed that relief will have to be afforded.

Deserving Democrats are awaiting action on a large number of jobs to be filled by the President. Most important is the War cabinet post, a vacancy caused by the death of Secretary George H. Dern. Another unfilled office of note is that of Comptroller General. Seven new members must be chosen for the new Maritime Commission. Among other vacancies are: Under Secretary of State, Under Secretary of the Treasury, Alcohol Administrator, Commissioner of Reclamation, three circuit judges and seven district judges.

Wants $1,000,000 Division

In its next budget the Bureau of Foreign and Domestic Commerce is planning to ask for about $1,000,000 to create a division that would be of great assistance to American business. Its staff would make a study of the cause of depressions and furnish monthly information.

Inquiries reaching Washington show it is not thoroughly understood that under the provisions of the Walsh-Healey Act, the Secretary of Labor has no authority to prescribe wages. All the Secretary may do is to determine the prevailing wage in a locality for a particular industry. If the industry happens to be confined to a single plant in the community, the prevailing wage in like activities may be prescribed.

As Representative Healey has explained, the original incentive for the act was to break up the prevalent practice of reducing payrolls so that particularly low bids could be made on government offers. Frequently this was done with the consent of the employees. Failure to get the contract might mean a layoff, so in many cases labor consented. The effect, especially since the start of the depression, has been to force wage rates down.

Casual reading of the law leaves the impression that work on government contracts in no case could exceed eight hours per day and forty hours per week. The regulations will provide for overtime, and the overtime rate of pay will be a condition of the bid.

Franklin Auto Plant Now Olympic Motors

Syracuse Factory In Deal With Veteran Car Executives

Transfer of the Franklin automobile plant in Syracuse to the recently incorporated Olympic Motor Car Co., Inc., of Syracuse, was announced this week by Ben Wiles, Syracuse attorney, who had been conducting negotiations. Arthur J. Brandt, Detroit industrial engineer, Alfred R. Glancy, of Bloomfield Hills, Mich., former vice-president of General Motors and John E. Williams, of Syracuse, are among the directors of the new company.

The Olympic Motor Car Co., Inc., filed a certificate of incorporation in New York State with H. P. Leonard, of Toledo, president of Franklin Motors, Inc., George W. Ritter, Toledo, vice-president of that concern, and Irving J. Davis, Syracuse, as directors.

OBERG ADVANCED

H. E. Oberg has been elected vice-president of Billings & Spencer Co., Hartford, Conn. He has been manager of the machinery and contract forging divisions of the company, and was formerly manager of the company's Detroit branch. C. D. Elliott has been elected vice-president.

BUSINESS ITEMS

Bantam Ball Bearing Co., South Bend, Ind., has appointed R. B. Nichols manager of its industrial bearings division.

W. W. Sly Mfg. Co., Cleveland, metal cleaning, foundry equipment and dust system manufacturer, has named Alexander Haigh New England representative.

Ohio Electric Mfg. Co., Cleveland, has appointed D. M. Fraser, president, D. M. Fraser, Ltd., Toronto, its Canadian representative.

Reid-Avery Co., Philadelphia, has moved its general offices to Dundalk, Md., where its welding rod factory is located.

Foote Bros. Gear & Machine Corp., 5301 South Western Blvd., Chicago, named Thomas Lord sales engineer in the Detroit territory.

Reed-Prentice Corp., Worcester, Mass., has appointed L. H. Mesker, Hollenden Hotel, Cleveland, exclusive agent for its line of lathes, die casting and injection molding machines.

Ajax Mfg. Co., Euclid, Ohio, hot metal working machinery manufacturer, has appointed Walter D. Snyder, Eastern sales representative. Mr. Snyder retired in June as a lieutenant commander in the U. S. Navy, where he was assigned to machinery and engineering work, and had been superintendent of the Boston Navy Yard.

Lincoln Electric Co., Cleveland, has appointed Industrial Supply Co., Salt Lake City, Utah, distributor of its arc welding products.

Signal Electric Mfg. Co., Menominee, Mich., will build a two-story addition because of increased business, John E. Henes, president, announced.

Lincoln Electric Co., Cleveland, will represent the Messer Co., Frankfort-on-Main, Germany, manufacturers of automatic oxygen machines, in the United States.

Jones & Laughlin Steel Corp., Pittsburgh, has appointed William Miller manager of sales of strip and sheet.

P. M. Mahler & Co., foreign sales managers, has moved to larger quarters at 115 Broad St., New York.

Dayton Rubber Mfg. Co., Dayton, Ohio, has transferred H. L. Berger to its industrial division, in charge of Dayton Cog-Belt sales, 121 North Broad St., Philadelphia.

Ohio Electric Mfg. Co., 5900 Maurice Ave., Cleveland, has appointed J. L. Vergilio Co., 942 Prospect Ave., Cleveland, sales agents for northern Ohio.

Ohio Gear Co., 1333 East 179th St., Cleveland, has named Adam-Hill Co., 244 Ninth St., San Francisco, distributors in that area for the company's line of gears, sprockets, shafts and speed reducers.

Dumore Co., Racine, Wis., has appointed W. J. Hermes its representative in the New York metropolitan area, with offices at 100 Varick St.

Industrial Review

• AFTER an unexpectedly busy and active summer the machinery industry faces the remainder of the year with much optimism. Only two handicaps are worrying the trade—shortage of qualified men for the exacting job of building machinery, and long deliveries in almost every line. Even a presidential election is not expected to be much of a drag on sales. In any event, foreign orders bid fair to fill up any holes in the domestic structure.

• THE EAST reports continuing good business at levels much above what had been expected for the summer. New England has been particularly active, one distributor of machine tools reporting August as the biggest month since 1929 and likely to equal any month of that boom year. New York district sales were off somewhat from the high July level but are expected to continue steadily upward during the fall. Philadelphia distributors also report good business and every expectation that it will improve during the last quarter of the year. In the Pittsburgh district orders are coming in in satisfactory volume and are expected to continue to do so.

• CLEVELAND is still concerned over the shortage of skilled men for the machine tool plants, which is indicative of the high level at which they are operating. Inquiries for equipment are increasing in Detroit which is taken to indicate that customers are finally awakening to the fact that prompt deliveries are no longer possible. Inquiries are also heavy in the Toledo district, many of them arising from the fact that old equipment is breaking down under the strain of steady operation.

• CINCINNATI distributors and builders of machine tools report an increase in orders, many of which come from projects to rehabilitate branch plants. Notwithstanding the extreme heat St. Louis distributors have been able to pick up a very comforting volume of orders for machine tools. Chicago reports maintenance of a satisfactory level of machine tool sales and a decidedly encouraging outlook for the fall. Milwaukee reports much the same situation although August was not as active as June and July.

• ON THE West Coast business is resulting from modernization in all types of industry. Machine shops catering to the mining industry are particularly busy. In the airplane field the report is that men employed in building planes now number 200 per cent more than a year ago. Welding equipment is moving in appreciable volume.

Motors AND OTHER MATTERS

Packard pulls fast play, unveils Six . . . Recovery held certain as demand instills confidence in industry . . . Zephyr's lines prove popular . . . Medium-priced field expanding . . . Machinery sales expected to continue

BURNHAM FINNEY
Western Editor

DETROIT — Packard got a running start on the rest of the automobile industry when it unexpectedly unveiled its 1937 cars to the public last Saturday. Its new six, almost a duplicate of its One Twenty except for a wheelbase five inches shorter, is creating much favorable comment. Packard has spent $5,100,000 to tool up for this new job and to double its plant capacity. It is advertising and publicizing its pioneering in surfacing broaching cylinder blocks on huge Cincinnati machines of special design.

Observers agree that the Packard six will rob the One Twenty of many sales, but the management expected that to happen. Packard is confident that 1937 will be the biggest year in its history. If the new six "goes to town," as everyone thinks it will, Packard will have to do more equipment buying later to secure much-needed production volume. The Packard plant is a beehive of activity, with production likely to continue high during winter.

Auto Show November 11

Studebaker will follow close on Packard's heels with introductions of new models next Saturday. Graham-Paige is scheduled to disclose its cars around October 1. The Big Three will hold off their products until near show time. Ford is reported to be planning on introducing its cars on November 14 at its own show at the Astor in New York and at the Chicago show opening that day. The national show, as usual minus Ford, opens November 11 in Grand Central Palace, New York.

No serious production delays are anticipated this fall by the industry. Some equipment orders were placed a little late, but by dint of "high-pressure" methods in which car manufacturers excel, deliveries are generally satisfactory. A few companies are sweating freely over delays, one being Chevrolet. Its output of new six-cylinder engines won't begin as soon as desired because of slowness in getting machinery installed at Flint, according to reports. Last year 1,109,911 cars and trucks were built by the industry during the September - December period. That represents an average of 277,477 units a month. That figure may be bettered this year. Probably 1936 will wind up the second best in the industry's history. Heretofore 1928, with production of 4,601,141 units, has held that honor.

No Setback Seen

As the 1937 season gets nearer, car manufacturers are gaining in confidence. The theory that the industry, after four years of recovery, is likely to sustain a setback, is rapidly fading. Most executives are of the opinion that the tremendous upsurge of business this year can be traced to natural causes which will still be at work in 1937, regardless of who is elected.

That the Lincoln Zephyr will set the industry's styling next season becomes increasingly apparent. The new Ford, it is whispered, will have body lines patterned somewhat after the Zephyr. A. O. Smith Corp. is understood to have designed for 1937 a new exceedingly stiff frame with I-beam X members instead of channels. The company is now working on the theory that the frame can be made so stiff that it relieves the body of any structural stress. Stout's famed Scarab car is equipped with a tubular frame.

With the market in the medium-price field expanding tremendously, General Motors is spending huge sums on its Buick, Oldsmobile and Pontiac divisions. Oldsmobile is increasing its capacity from 55 to 85 cars per hour, will be able to build 300,000 cars next year. Buick is rushing to completion a large construction program. Each year General Motors selects one division to favor in expenditures and in general attention. This year it was Buick; next year Pontiac will be the white-haired boy. Pontiac built 167,510 of its 1936 models for the domestic market, is hitting for more than 200,000 during 1937. The management hopes to increase sales 30 per cent. Probably its biggest achievement has been to strengthen dealer outlets, of which there are 3,500 today. Capital outlay for 1937 is six million dollars.

Hypoid Gears in Vogue

Hypoid gears for rear axles will be the vogue next year. All Chrysler-made cars will have them, it is said, but there is not unanimity of opinion in General Motors ranks regarding them. At least Pontiac will not have them.

Chrysler's new De Soto factory is almost ready to start operations. It is expected to be one of the show places of the industry. Chrysler is bullish about 1937 prospects, but is guarding against expanding too rapidly for fear that it may be overloaded with plant capacity when the next period or business recession comes.

Ford is understood to have denied that it intends to bring out a new small car. It has not denied, however, that it will offer two cars using a chassis of the same size and design, one car to be powered by the small motor and the other by the present-sized motor. No one knows what the price of the car will be, if the small-engined car is introduced, but it is a safe bet that it will be low enough to test the theory that a rich market exists in a price field below that now touched by any important maker. If the car should sell in large numbers, Ford would be compelled to buy a substantial amount of equipment to augment its facilities.

A spirit of confidence exists at Dearborn, despite the fact that Ford has played second fiddle to Chevrolet in sales this year.

Machinery buying is as near a standstill as it has been in Detroit for months. No major programs are expected until 1937 models are in production and the public demand is gaged. Then equipment will be bought to strengthen lines in anticipation of next spring's sales. Early orders for 1938 also will stimulate the volume of machine tool business the coming winter. Machine tool offices have their hands full keeping delivery promises made to car companies.

Corrosion Symposium To Be ASME Feature

Annual Meeting, Nov. 30, To Include Novel Program

A symposium on Corrosion Resistant Metals in Design of Machinery and Equipment will be held as part of the American Society of Mechanical Engineers' Annual Meeting in New York City, Nov. 30 to Dec. 4. The information presented is to be in compact form, of a practical nature, free from lengthy theoretical discussions but still sufficiently complete that when the different papers are assembled they will form a handy reference for the engineer of the subject of corrosion resistant metals.

Need for such a symposium has been expressed by engineers who are constantly confronted with many problems on corrosion. Not many have been able to follow closely the rapid development of this type of information during the past few years. Several of the professional divisions of the Society joined in developing the symposium, making it a feature of the A.S.M.E. Annual Meeting where it has been allotted the whole day of Dec. 3 with three sessions in the morning, afternoon and evening. T. H. Wickenden, past chairman of the Society's Iron and Steel division was appointed chairman of the symposium committee.

The papers are:

Introduction to Corrosion Resisting Metals—Dr. F. N. Speller, National Tube Co., Pittsburgh, Pa.

Alloys of Aluminum—E. H. Dix, Jr., Aluminum Company of America, New Kensington, Pa.

Nickel and Nickel-base Alloys—F. L. LaQue, The International Nickel Co., Inc., New York, N. Y.

Zinc in the Chemical Industries—E. A. Anderson, The New Jersey Zinc Company, Palmerton, Pa.

Lead—G. O. Hiers, National Lead Company, Brooklyn, N. Y.

Cast Iron in Chemical Equipment—Dr. H. L. Maxwell, E. I. duPont de Nemours, Co., Inc., Wilmington, Del.

Copper and Copper-base Alloys—R. A. Wilkins, Revere Copper and Brass, Inc., Rome, N. Y.

Corrosion Resistant Steel (Stainless Type)—J. H. Critchett, Union Carbide & Carbon Research Laboratories, Inc., New York, N. Y.

PERSONALS

GEORGE O. CLIFFORD, president of Evansville Tool Works, Evansville, Ind., has resigned to become assistant to the president of Fayette R. Plumb, Inc., Philadelphia.

HENRY J. FISHBECK, chief metallurgist, Pratt & Whitney Aircraft division, East Hartford, Conn., has been appointed to the Metallurgical Advisory Committee, Hartford Ordnance district, United States Army.

MILES G. HANSEN has been appointed superintendent of AC Spark Plug Co., Flint, Mich. He was formerly general manager of Norwood Electric Foundry Co., Norwood, Mass.

C. N. KIRKPATRICK, secretary and sales manager, Landis Machine Co., Waynesboro, Pa., sailed Aug. 28 on a business trip to England and the Continent.

ROWLAND S. ROSE has been appointed chief engineer of Wentworth & Irwin Co., Portland, Ore., truck and bus body manufacturer.

B. M. SHEFFER has been appointed road foreman of engines of the M. C.-F. D. division of the Chicago Great Western Railroad Co.

PHIL G. SUTTON, formerly general manager of Emich Motors Corp., Oak Park, Ill., has been appointed chief manufacturing executive of Netter Heiser & Co., Inc., Milwaukee.

A. R. WEIGEL has been named works manager of Stover Mfg. & Engine Co., Freeport, Ill.

OBITUARIES

WILLIAM ALBERT EDWARD DOYING, inspecting engineer, Panama Canal, died Aug. 3 in Washington. He was in charge of inspecting machinery, materials and locomotives during the construction of the canal.

W. A. HECKERT, 58, president, Heckert Metal Manufacturing Co., Kansas City, Mo., died there recently.

CARL C. HINKLEY, 53, a pioneer automotive engineer and manufacturing executive died Aug. 20, in Detroit.

DAVID MCWHIR, 53, chief inspector of Pratt & Whitney Aircraft Co., East Hartford, Conn., died recently. He had been associated with Wright Aeronautical Corp.

MEETINGS

AMERICAN SOCIETY OF MECHANICAL ENGINEERS, Niagara Falls Meeting, Sept. 16-19, Niagara Falls, N. Y., C. E. Davies, secretary, 29 West 39th St., New York, N. Y.

AMERICAN WELDING SOCIETY, Oct. 19-22, Hotel Cleveland, Cleveland. Miss M. M. Kelley, secretary, 29 West 39th St., New York.

DAIRY & ICE CREAM MACHINERY MANUFACTURERS ASSOCIATION, Oct. 12-17, Atlantic City, N. J. Roberts Everett, vice-president, 232 Madison Ave., New York.

INTERNATIONAL ACETYLENE ASSOCIATION, 37th annual Convention, Nov. 18-20, St. Louis.

NATIONAL METAL SHOW. 18th Annual Exposition. Oct. 19-23, Lakeside Exposition Hall, Cleveland. W. H. Eisenman, secretary, 7016 Euclid Ave., Cleveland.

NATIONAL SAFETY COUNCIL, INC. 25th Congress, and Exposition, Oct. 5-9, Atlantic City, N. J.

SOCIETY OF AUTOMOTIVE ENGINEERS, INC., Aircraft Production Meeting Oct. 15, 16 and 17, Los Angeles, Calif. John A. C. Warner, secretary and general manager, 29 West 39th St., New York.

TWELFTH NATIONAL EXPOSITION OF POWER AND MECHANICAL ENGINEERING, Nov. 30—Dec. 5, Grand Central Palace, New York, Charles F. Roth, manager.

EXPORT OPPORTUNITIES

Garage equipment, automobile repair tools. (Agency) Buenos Aires, Argentina. *1365.

Hardware. (Agency.) Buenos Aires, Argentina. *1365.

Metallurgical equipment, testing machinery. (Agency.) Paris, France. *1394.

Coal briquetting machinery. (Purchase.) Florence, Italy. *1383.

Machine tools, mining equipment and hardware. (Agency.) Paris, France. *1381.

Measuring instruments and testing machinery. (Agency.) London, England. *1430.

Electric hand drills. (Purchase.) Montreal, Canada. *1407.

Grinding mills for soya bean cake. (Purchase.) Kobe, Japan. *1423.

Hosiery knitting and repairing machinery. (Agency.) Barranquilla, Colombia. *1443.

Lathe chucks, manufacturing machinery. (Purchase.) Paris, France. *1444.

Machine tools, metal stamping presses. (Agency.) London, England. *1442.

Machine tools. (Agency.) London, England. *1430.

Textile machinery. (Agency.) Roubaix, France. *1439.

Industrial and scientific instruments and testing equipment. (Agency.) Tunis, Tunisia. *1441.

*Interested American firms and individuals may obtain the names and address of the foreign firms making these inquiries upon application to the Bureau of Foreign and Domestic Commerce, U. S. Department of Commerce, Washington, or any district or cooperative office. Please refer to key number.

American Machinist REFERENCE BOOK SHEET ©

Shop Measurement of Plated Coatings

Microscopic measurements of cross sections are usually employed in measuring the thickness of metal coatings, such as electroplated coatings. These microscopic measurements require considerable time by skilled operators. For this reason the method developed by William Blum and Abner Brenner of the National Bureau of Standards is of interest because it makes possible measurements of electroplated coatings by shop men. It is an enlargement of Mesle's chord method, and under favorable conditions an accuracy of about 10 per cent is usually obtainable.

The method is illustrated in Fig. 1. If a grinding wheel of radius R just cuts through a plated coating of thickness T on a flat surface, the width of the cut is determined by the thickness which can be computed from R and C. The same relation exists if the coating on a curved surface of radius R is just cut through with a flat file. Where the thickness is small compared to the radius, a simplified equation is satisfactory for either case:

$$T = \frac{C^2}{8R} \qquad (1)$$

In testing flat surfaces the grinding wheel should be the largest that will run true on the machine used. On curved surfaces the effective magnification for a given thickness is fixed by the radius of curvature. As the thickness varies as C^2, any error in measuring C will produce about twice that relative error in the calculated thickness. For practical measurements, where an accuracy of plus or minus 10 per cent is usually desired, the width should therefore be measured with a precision of at least 5 per cent. With the average pocket lens and scale it is possible to measure a width as small as 0.08 in. with this precision on the average plated surface. This width of cut is produced by a wheel with a radius of 4 in. on a coating 0.0002 in. thick. The method is therefore not accurate with much thinner coatings, on which, moreover, the definition of the narrower cut is less distinct.

Equation 1 shows that an error in measuring the radius of the wheel or plated surface produces about the same percentage error in the calculated thickness. The small changes in the radius of the wheel that occur during its moderate use are therefore not significant, but the wheel should be measured often enough to know its radius within about 2 per cent.

When a curved surface has a radius of more than 1 in. a grinding wheel produces a more sharply defined cut than a file. Fig. 3 shows an arrangement for applying a wheel to a coating on a convex spherical surface. The object is moved back and forth under the wheel in a direction parallel to the wheel axis while the wheel is lowered with the micrometer feed in increments of about 0.0002 in. If the width of cut C_1 is measured parallel to the wheel axis, the result is the same as if the file had been used, and the equation 1 employed. If, however, the width of the cut C_2 is measured perpendicular to the wheel

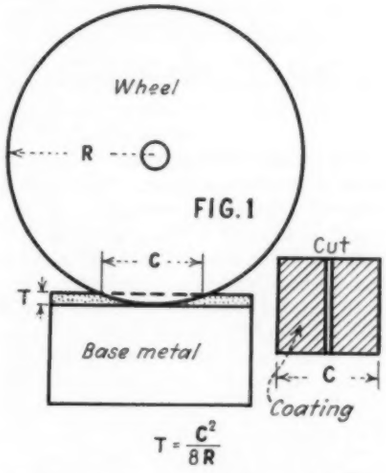


Fig. 1—Testing a coating on a plane surface with a grinding wheel

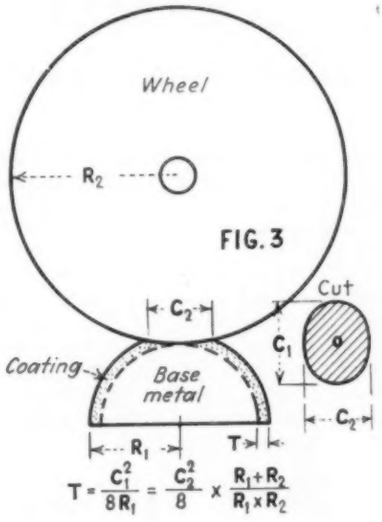


Fig. 3—Testing a coating on a sphere with a wheel

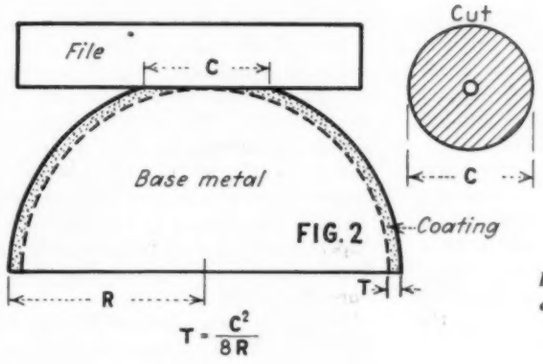
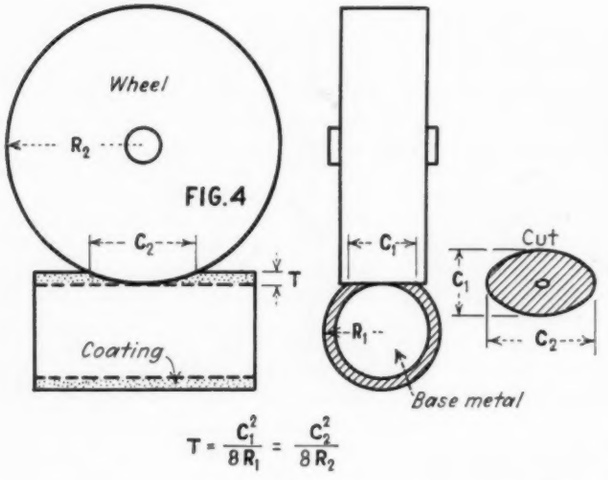


Fig. 2—Testing a coating on a spherical surface with a file

Abstracted from Research Paper RP866, published by the National Bureau of Standards, U. S. Department of Commerce.

Shop Measurement of Plated Coatings



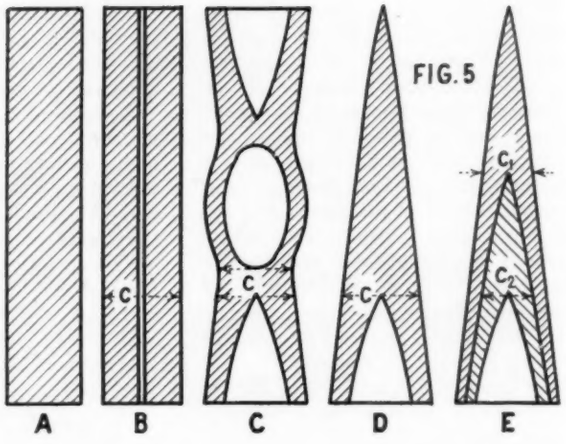


Fig. 4—Testing a coating on a cylinder with a wheel. Fig. 5—Appearance of typical cuts made with a wheel on a flat surface

axis, the radii of both the wheel R_2 and the curved surface R_1 enter into the calculation, in accordance with the equation below:

$$T = \frac{C_1^2}{8}\left(\frac{R_1 + R_2}{R_1 \times R_2}\right) \qquad (2)$$

If, for example, the width of cut was 0.10 in., when a surface with a radius R_1 of 1 in. was tested with a wheel having a radius R_2 of 4 in., then

$$T = \frac{(0.10^2)}{8}\left(\frac{1+4}{1\times 4}\right) = 0.0016 \text{ in.}$$

For testing a cylinder, the arrangement shown in Fig. 4 may be used, with the axis of the wheel perpendicular to the axis of the cylinder. The cut is made in the way described for Fig. 3, and has the section shown in Fig. 4. If the width is measured in direction C_1, the result is the same as with a file, and equation 1 is used with R_1, that is, the radius of the cylinder. If the cut is measured in direction C_2, the result is the same as if the wheel had cut a plane surface. Equation 1 is again used, but with R_2, that is, the radius of the grinding wheel.

For testing coatings on nearly flat surfaces, a precision surface grinder with a magnetic chuck is convenient. If the wheel is brought down so that it just cuts the plane surface, and the latter is moved parallel to the wheel axis, a cut with parallel edges as in *A*, Fig. 5, will be produced. If this cut does not expose the base metal the wheel is lowered slightly, for 0.0002 in., and a deeper cut is made, and so on until the base metal is just exposed as at *B* in Fig. 5. The width *C* of the last cut is then measured.

There are two practical difficulties in applying this procedure. It involves making repeated cuts, and it is difficult just to expose the base metal. Moreover, most commercially flat surfaces are not exactly plane, and in practice the cut is likely to resemble *C*, Fig. 5, on which the base metal is exposed for only part of the length. This behavior suggests a simple modification. The surface is tilted slightly by putting a sheet of paper under one edge of the magnetic chuck. The cut, as in *D*, Fig. 5, then tapers, and it is easy to note where the base metal is just exposed, and to measure the width *C* at that point. The thickness is then calculated by the first equation. With multiple coatings as at *E*, Fig. 5, the thickness of each layer is computed from the width of cut C_1 or C_2 where the next layer is just exposed.

With soft base metals such as zinc, copper and brass or with coatings containing copper layers, fine wheels fill up and drag the metal, so that the boundaries are not sharp. The best grain for each combination of metals will depend upon the peripheral speed and possibly upon other factors. A 120 grain wheel (Norton 38120 J) was found to be most satisfactory for the hard metals, and a 90-grain (Norton 3890 H) for soft metals.

The tests made with a fine file on spheres and cylinders can be very satisfactory if certain precautions are observed. It is essential that the file travel in a plane. Rocking can be prevented by attaching, to the vise which holds the specimen, a steel support that is level with the surface to be tested and is a few inches away. The file rests on this support and the article and is thus kept in a plane.

Although the coating is necessarily damaged in the test, the base metal is penetrated so little that the tested articles can usually be salvaged by stripping, polishing and replating.

Ideas FROM PRACTICAL MEN

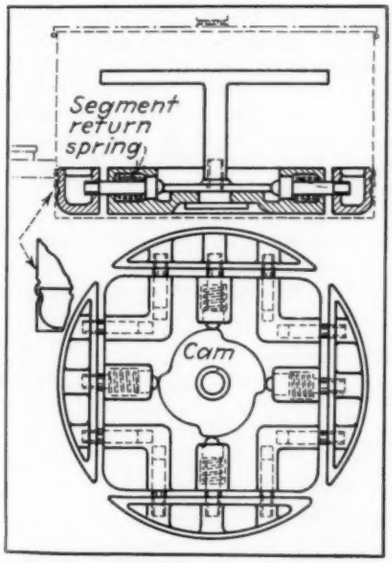
An Expanding Block

F. DOUGHERTY
Shipley, Yorkshire, England

Trouble was experienced in securing the bottoms in some drums about 16 in. in diameter and 14 in. high, the thickness of the material being 20 gage. The bottoms were locked by forcing the flanges into small circumferential grooves in the shells. The work was done in a vertical seaming machine having a revolving pressure disk on top of the drums; a revolving table on which the drums were mounted; and a grooved seaming wheel that could be adjusted for pressure.

A built-up block was placed on the insides of the shells to back them up against pressure from the seaming wheel. The difficulty was that the shells were forced inwardly by the seaming wheel and the block was locked so tightly that it could not be removed as a unit. To overcome the difficulty, the expanding block illustrated was made. It consists of a simple center block fitted with four expanding segments, each being guided by two pins; and a four-lobed cam to operate the segments through spring-actuated pins that are screwed into the segments.

In operation, before seaming, the block is placed in the bottom of the drum and the segments are expanded by rotating the cams counterclockwise. After seaming, the cam is rotated clockwise and the springs draw the segments inward, permitting the block to be easily removed.



In the bottom of the drum this block is expanded to back up the shell against seaming pressure. It is expanded and collapsed by a four-lobed cam

Hob Sharpening In a Simple Fixture

HECTOR J. CHAMBERLAND

When the quantity of hobs to be sharpened does not permit the use of special equipment, the simple fixture illustrated can be employed. It will give accurate results for sharpening helical-flute shank hobs or other hobs under 3x3 in. Housing *A* is attached to base *B*. Index plate *C* attached to *A* has the required number of divisions in the form of ⅛ in. holes. Bushing *D* is machined to fit the bore of *A* and is made adjustable to a hand turning fit by locknuts *F*.

Into *D* is milled a slot ¼ in. wide having an angle corresponding to the spiral of the flute to be sharpened. At least four slots of different angles can be cut into the same bushing, thus accommodating that number of operations. Any number of index plates as at *C* can be made as required, as they are held to *A* with two small screws.

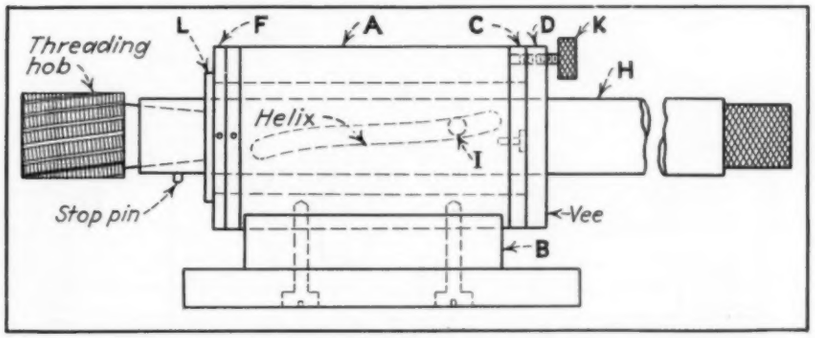
Arbor *H* is threaded for regular hobs and is a duplicate of the conventional bar used for sharpening end mills. It has a hardened guide pin *I* which, in connection with slot *D*, maintains the original angle of spiral. Indexing screw *K* can be made as shown or in the plunger type. A felt washer *L* is cemented to the outer part of the nut *F* to exclude dust from arbor *H*.

Anchoring Babbitt Linings

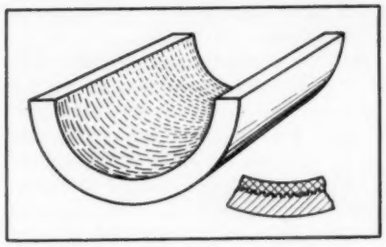
E. N. DAVEY
Vancouver, B. C., Canada

In a railroad shop where a large number of brasses were lined with babbitt, considerable trouble was caused by the babbitt linings working loose and finally falling out in broken pieces. This trouble had been going on for a number of years, in spite of more attention being given to tinning, spacing of anchor holes, and so on.

The writer was called upon to diagnose the trouble at a time when it became quite serious. After considerable thought he hit upon the idea of doing away with the six or eight anchors that were drilled along the sides of each brass, and substituting rough boring therefor. The feed of the lathe in which the brasses were bored was increased to about 0.090 per in. instead of the former 0.010 or 0.015 per in. This change, together with grinding the tool so that the cut was somewhat rough at the sides, as shown in the illustration, cured the trouble entirely. The small sketch at the right



As many as four slots of differing helix angles can be cut in bushing D



Instead of drilling holes to anchor the babbitt lining, the brasses were bored at a greater feed, the tool being ground to cut roughly at the sides

shows in an enlarged way the appearance of a section of the finished job.

In addition to curing the trouble, the brasses were bored in less than one-third of the time formerly required. At the end of two years a careful check was made and not one brass from the ones thus prepared had come in with a loose or broken lining. Incidentally, tnning was continued as before.

Toolmakers' Vise With Swivel Jaws

JOHN A. HONEGGER

In the illustration is shown a toolmakers' vise having auxiliary jaws that swivel in the vertical plane, and are so arranged as to hold straight or tapered work either vertically or at an angle.

The auxiliary jaws *A* and *B* are pivoted to the regular jaws and bear in circular seats therein, so that the pressure of holding the work is not borne by the pivot pins. Taper pins *C* and *D* locate the auxiliary jaws in any of the angular positions indicated by the half-round notches *F* and *H*, which can be spaced at any desired angle to permit work to be held at that angle for drilling and tapping.

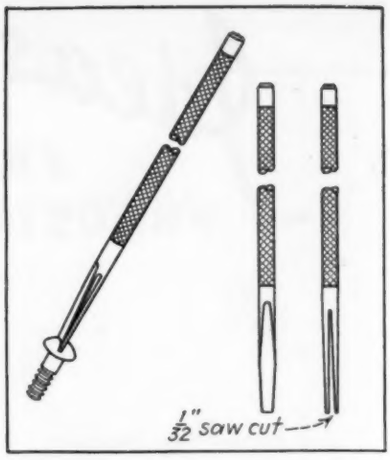
To permit wide work to be clamped without interference from the ears through which the pivot pins pass, the notched plates *I* and *K* are attached to the flat faces of the auxiliray jaws. For holding tapered work, pins *C* and *D* can be removed, permitting the auxiliary jaws to adjust themselves to the taper. The other details of construction are the same as in an ordinary toolmakers' vise.

Spring Screwdriver for Screws Hard-to-Reach

W. KASSEBOHM

Difficulties are often encountered in assembling small screws in almost inaccessible places. Examples are machines such as typewriters and adding machines, also radios, where the screw must be held by the screwdriver without any assistance from the fingers.

To overcome such difficulties, the spring screwdriver illustrated was made from drill rod. It is slotted, filed to the necessary thickness, hardened and spring tempered. In use, the two "legs" are pressed together by the thumb and forefinger and the point is entered in the screw slot. When pressure on the legs is released, they spring apart and bind in the slot, holding the screw.



The two "legs" are pressed together and the point is entered in the screw slot. When pressure is released, the legs spring apart and bind in the slot

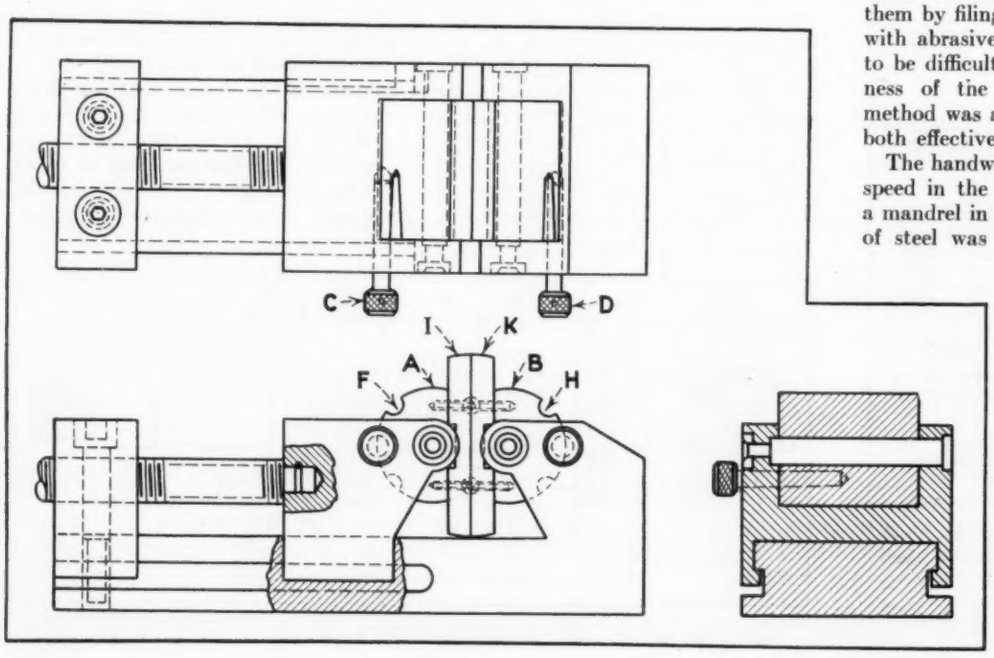
The handle is knurled for better finger grip and the screwdriver is strong enough to tighten small screws. Larger screws can be started in the tapped holes by it and afterward tightened by a larger and solid screwdriver.

Worn-Out Grinding Wheel Finishes Handwheel Rims

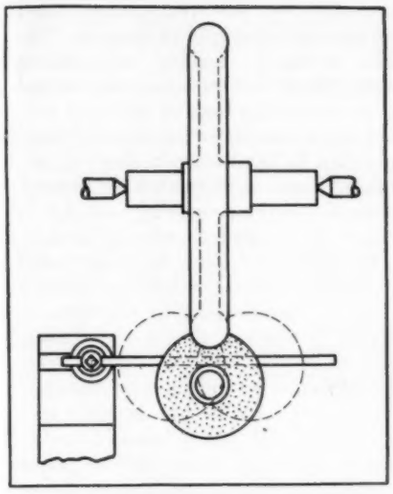
L. KASPER

The rims of a quantity of cast-iron handwheels were required to be finished to a bright polish. No allowance had been made on the rims for finishing by turning, the original intention having been to rough finish them by filing and to then polish them with abrasive cloth. The rims proved to be difficult to file, due to the hardness of the scale, so the following method was adopted and proved to be both effective and economical.

The handwheels were rotated at high speed in the lathe, being mounted on a mandrel in the usual manner. A bar of steel was clamped in the toolpost



The auxiliary jaws are pivoted to the regular jaws and bear in circular seats therein, relieving the pivot pins from pressure due to clamping



A discarded abrasive wheel was used to rough finish the rims of handwheels. It was held in the hands and rested on a bar in the toolpost

for a rest, as shown in the illustration. The rough finishing was accomplished by means of a discarded abrasive wheel held in the hands and resting on the steel bar and given a rocking motion, as shown by the dotted lines, following the outlines of the rim. No attempt was made to shape the abrasive wheel, it being formed to the shape of the rims by natural wear. The rims were then polished with fine abrasive cloth.

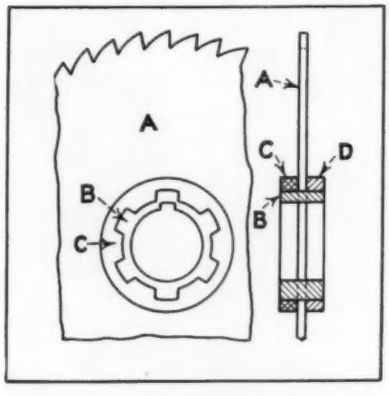
Multiple Splines for Slitting Saws

R. H. HANDLEY

Where a slitting saw ⅛ in. thick and 6 in. or more in diameter is driven by a single key in the cutter arbor, the stress of the cut sometimes causes the saw to turn enough on the arbor to shear a notch in the key.

Such a condition suggested the arrangement shown in the illustration, in which *A* is a slitting saw having six keyways; *B* is a bushing having six splines or integral keys to fit the keyways in the saw, and a keyway to fit the key in the cutter arbor. *C* and *D* are collars. The bushing projects through the saw about ¼ in. on each side, the projecting ends being covered by the collars, which are thick enough to cause them to bind the saw and not the bushing when the arbor nut is tightened.

While it is true that the driving is done by the single key in the cutter arbor, the keyway in the bushing is much longer than the thickness of the saw and will stand the pressure of the cut without shearing a notch in the key.



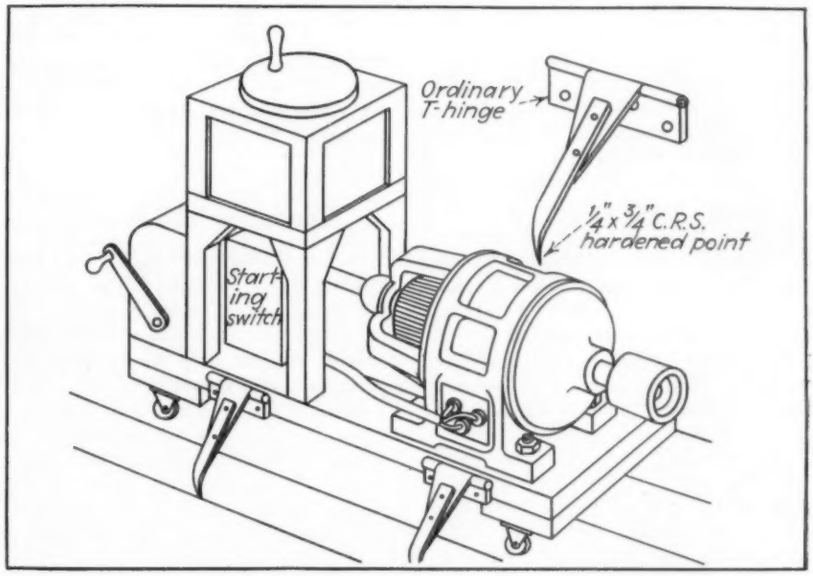
The keyway in the bushing is long enough to prevent the pressure of the cut causing it to shear the key

Testing Motors Anchored With Little Labor

ROGER C. DICKEY
International Paper Box Machine Company

Testing motors are generally located in one position for a short time only. While it is essential that they be firmly anchored while in use, it is quite a problem to anchor them in each location without involving too much labor. The most satisfactory arrangement I have ever seen is shown.

Four large T-hinges are secured to the sides of the wood base of the motor. To the strap part of each hinge is attached a strip of cold-rolled steel ¼ in. thick and ¾ in. wide, as shown in the enlarged view in the upper right-hand corner of the illustration, either by riveting or spot welding, the outer ends being pointed, turned down and hardened. By exerting pressure with the foot on the steel strips, the points can be worked into the floor sufficiently to secure an anchorage. As soon as the test is over, the steel points can be drawn out of the floor and the motor can be moved to the next job of testing.



Hardened points attached to the strap parts of the hinges are worked into the floor, anchoring the testing motor securely

Timers Will Shut Down Idle Machine Tools

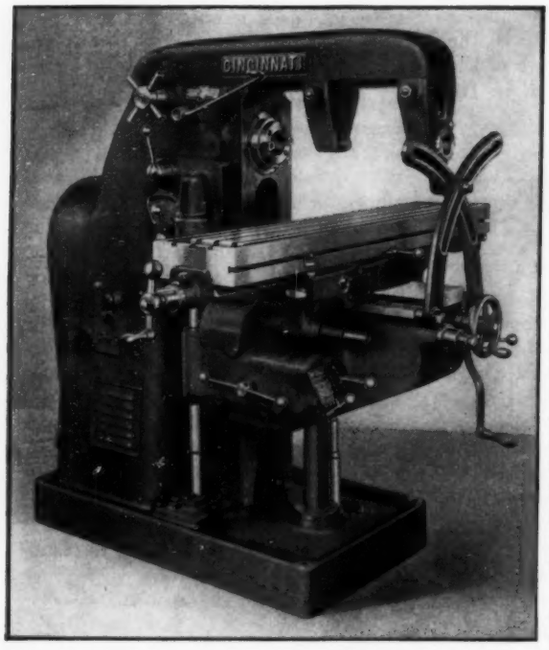
SAM MOSKOWITZ

After starting their machines in the morning most machine operators will let the motor run until quitting time, regardless of whether the machine is actually producing or not. This applies particularly to turret lathes, punch presses and brakes. The time lost may be for such reasons as getting another job, studying blueprints, accumulating tools, setting up and waiting for information. I will venture to say that in an 8-hr. day some motors run idle for 2 to 3 hrs.

My suggestion is to install a timer attached to the operating or clutch lever, so that when the lever is in neutral the timing switch starts into action after a lapse of 3 min. or any other desired time. Thus, the main switch would be cut off automatically and the operator would have to restart the motor.

Shop Equipment NEWS

Cincinnati No. 2-MH Milling Machine



A pilot wheel on the rectangular overarm aids convenient and quicker set-ups on a 2-MH Cincinnati Milling Machine

Small and medium-size work pieces in toolroom or job-lot quantities are milled on the No. 2-MH milling machine developed by the Cincinnati Milling Machine and Cincinnati Grinders, Inc., Cincinnati, Ohio. The No. 2-MH is of the same general design as the L type, except that it is larger and heavier throughout. The rectangular overarm is provided with a pilot wheel for adjusting it to position, resulting in more convenient and quicker set-ups.

Both plain and universal machines are built. Ranges are: 28 in. longitudinal table travel, 10 in. cross travel and 19 and 18 in. vertical travel, respectively. Fifteen spindle speeds are available from 23 to 1,200 r.p.m. and are obtained by shifting two quick-acting levers. The spindle reverse lever also operates the motor starting switch, and therefore controls the starting and stopping of the motor.

Twelve feeds are available. The standard longitudinal feed is ¾ to 30 in. per min. Power feeds for the cross and vertical travels are also included. All feeds are reversible from the front and rear, and power rapid traverse in six directions is standard equipment.

Universal machines are equipped with a 10 in. universal dividing head and a totally inclosed driving mechanism for milling helixes ranging from 2½ to 100 in. lead. Net weights are, plain machine, 4,000 lb., universal machine 4,400 lb.

Bonderite "Z" Process

Parker Rust-Proof Co., 2174 E. Milwaukee Ave., Detroit, Mich., has developed a process called Bonderite "Z" to prevent corrosion and stabilize paint finishes on zinc-alloy die castings and galvanized and galvanealed iron. It is a chemical conversion process that both coats and converts the surface of the metal. It produces an absorbent, paint-holding, crystalline structure on the surface and also an insoluble phosphate salt coating that becomes an integral part of the metal itself.

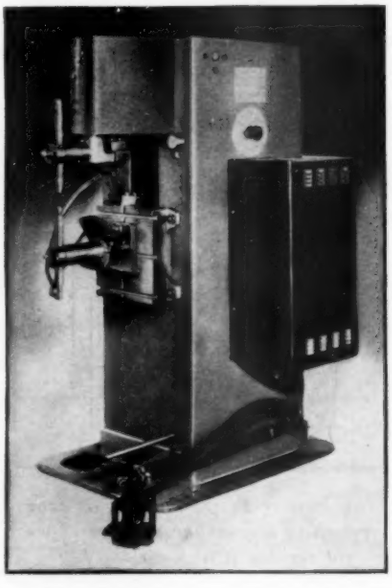
Bonderite "Z" contacts all surfaces equally whether in recesses, depressions or internal threads. It is applied at comparatively low temperatures and for the use of simple equipment. Besides ordinary cleaning and rinsing tanks, the only other equipment needed is the processing tank of sufficient size, and trays, baskets or hooks in sufficient quantity to handle production requirements. Parts to be treated are cleaned, immersed in the processing tank for ½ to 3 min., removed, rinsed and dried.

Bonderite "Z" comes in concentrated liquid from which requires the addition of water for the working solution. A simple titration indicates the concentration of the solution. The Parker Rust-Proof Co. will license manufacturers who wish to put in their own processing equipment, and complete service will be available to small manufacturers and occasional users at the company's jobbing service plants throughout the country.

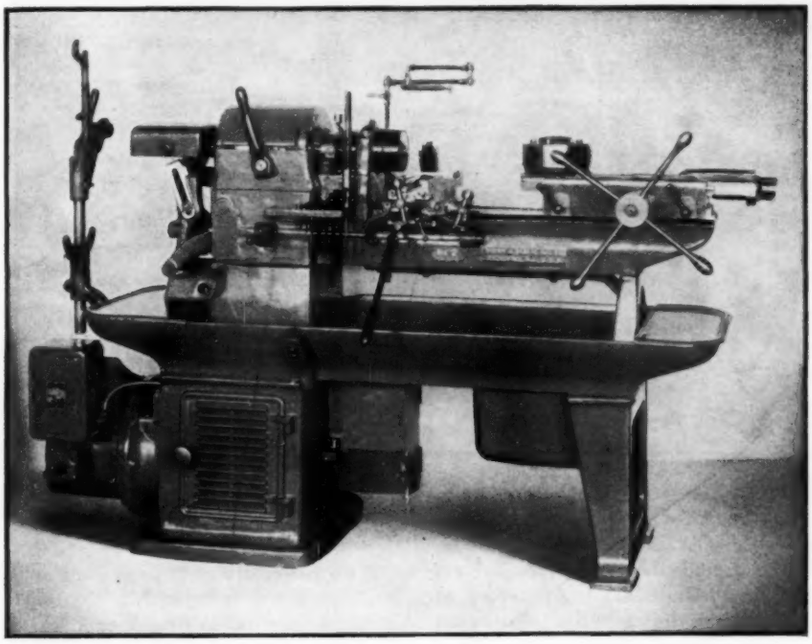
Eisler Press-Type Resistance Welders

A line of large press-type resistance welding machines, available up to 250 kva., in foot, motor or air operated models, has been announced by Eisler Engineering Co., Inc., 750 South 13th St., Newark, N. J. These machines are intended for handling various thicknesses of metal and are made in throat depths from 16 inches up to 48 inches. They may be had with speed changes ranging from 30 to 100 welds per minute.

The welder is a self contained unit; the timer, contactor and switch being assembled in the welder. With this welder the operator has all the welding accessories handy, allowing more efficient operation and economy of time.



Brown & Sharpe No. 2 Wire-Feed Screw Machine



Introduction of its No. 2 wire-feed screw machine by the Brown & Sharpe Mfg. Co., Providence, R. I., completes the range of three sizes in its line of semi-automatic screw machines. Each size is built in a motor and overhead driven type. These machines are efficiently and cheaply set up for small-run jobs, or for parts subject to frequent changes in design where special tooling is not warranted.

A wide speed range and high spindle speeds are provided so that all classes of materials can be machined at the maximum speed their machinability will allow. Full advantage can be taken of the free-cutting materials such as brass, aluminum and high sulphur steels. The high ratio (5 to 1) between the fast and slow speeds enables a slow speed to be used for threading and high speed for other operations such as forming, turning, drilling and cutting off.

Time-saving features of automatic feeding of stock, fast indexing of turret, and convenient means of reversing spindle assure high rates of production. Adjustable stops on cross slides and turret slides, together with precision workmanship, permit very close tolerances to be maintained on the work. The positive clamp for the turret slide bed is another aid in providing rigidity and assuring accuracy.

While primarily intended for bar work, these machines are also efficiently adapted to secondary operations on work that can not be completed on the bar. The threaded nose of the spindle permits use of standard chucks or special fixtures for performing operations on forgings, castings, stampings and similar articles.

The bar capacity of the machines is large and oversize feed tubes are available to allow handling of larger stock, for light work, than the rated normal capacity. Collets, feeding fingers and many turret tools used on these semi-automatic machines are interchangeable with those used on Brown & Sharpe Automatics.

While generally consistent in design with the smaller capacity machines, the No. 2 size has additional features which are especially valuable on the larger classes of work. The automatic clamping of the turret provides the rigidity required for heavier cuts. The cross slide is arranged with longitudinal feed by hand which is a feature that can be used to good advantage for turning behind a shoulder.

The machines have the following rated capacities: No. 0, 3/8 in., No. 1, 5/8 in., and No. 2, 1 in. Turn any length to 2 1/4 in., 4 in., and 6 in. respectively. Oversize feed tubes are available to allow handling of larger stock for light work. On the motor-driven machines there are twenty changes of spindle speed, ten in either direction, made by change gears. On the overhead driven, there are nine changes, six forward and three backward. Spindle speeds in every case are provided in ranges to permit machining the rated stock diameter at maximum allowable surface speeds.

Lincoln SA-150 Arc Welder

A motor-driven, single operator arc welder for general fabrication and repair work has been developed by Lincoln Electric Co., Cleveland. Designated as the SA-150, it has a current range of 45 to 200 amp. It is intended for metal work, hard-facing, pipe welding, cast iron repair fit-up and auxiliary work in shops where heavy welding predominates, regular production welding involving steel, alloy and non-ferrous plates and shapes. It can be used with either bare or shielded arc type electrodes.

The machine is built with insulation insured against burnouts, permitting sustained overloads without injurious effect and can be used with electrodes as heavy as 1/4 in. It has dual control of voltage and current, allowing independent adjustment of arc heat and arc penetration to suit the welding application.

Westinghouse "Phos-Copper" Brazing Alloy

Refinements in "Phos-copper" brazing alloy, manufactured by Westinghouse Electric & Mfg. Co., include annealing and pickling to insure freedom of any carbonaceous deposit on the surface which might interfere with the production of leak proof joints such as for refrigerator parts and radiators where such joints are necessary. It is an alloy

of phosphorus and copper developed to replace expensive silver solders, and has a relatively low melting point, high tensile strength and excellent penetration. Uniformity of alloy, self fluxing properties for most applications, high ductility, high fatigue resistance, high corrosion resistance, high electrical conductivity, high fluidity at brazing temperatures make it economical to use. Brazed joints may be electroplated or tinned. Available in rod, ribbon, washers, strip and other shapes. Standard rods are three feet in length with diameters of 1/16, 3/32, 1/8, 3/16 and 1/4 in. Ribbon is 0.015 in. thick by 1.25 in. wide. Other shapes are available.

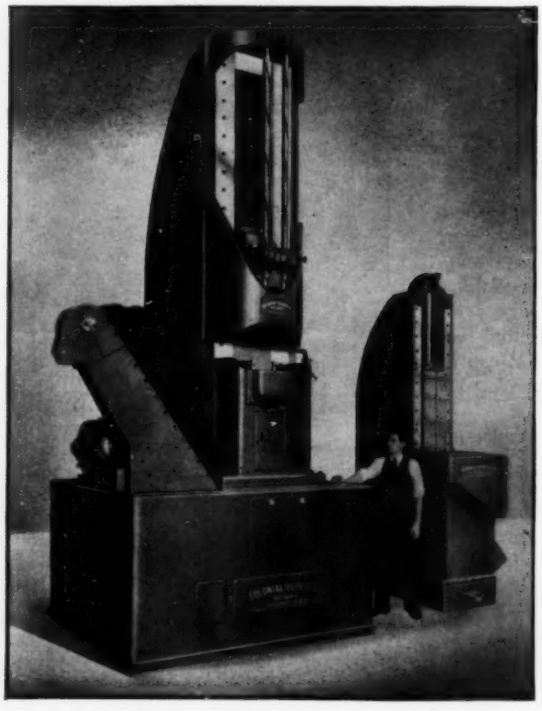
It is applied as soft solders, except "Phos-copper" requires a higher temperature. It melts at 707 C., easily obtained with an oxy-acetylene torch, incandescent brazing or carbon arc. At brazing temperatures it flows freely over the surface, facilitating the brazing of hard-to-get-at joints. It is self fluxing when used on ordinary copper work where it is not necessary to secure gas or liquid tight joints.

Colonial Broaching Machine for Spiral Splines

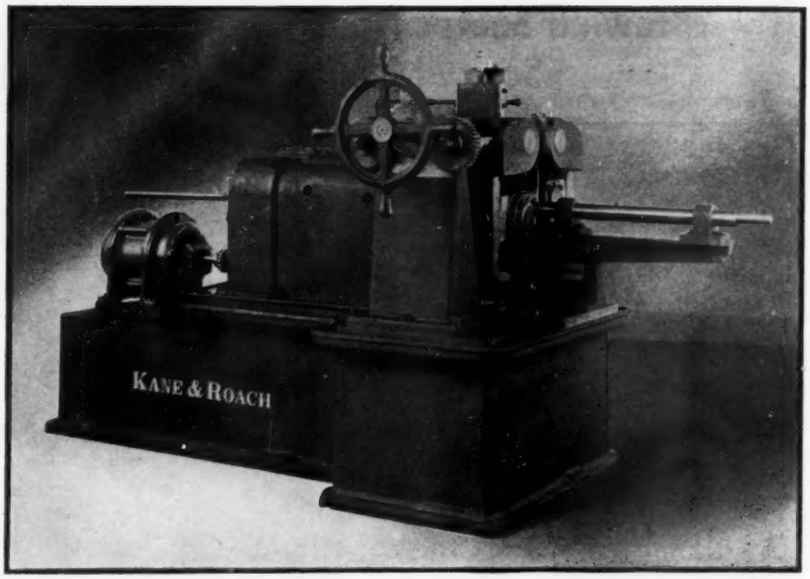
The Buick Motor Company has installed a huge vertical broaching machine made by the Colonial Broach Co., Detroit, Mich., the machine measuring 16 ft. from base to top. It was necessary to sink it into a pit 4 ft. deep to gain ceiling clearance so that work could be handled easily and quickly.

The machine broaches spiral splines in gears. The size of the gear to be broached and the stock removal required made necessary the provision of a machine having a 30-ton pressure on the ram. This is achieved by coupling a 40-hp. and a 20-hp. motor directly to a combination of hydraulic pumps. Cutting speed is 30 ft. per min. at this pressure. The ram itself has a stroke of 5 ft. and two gears are broached side by side in order to get the necessary production.

Broaches are handled by hydraulic cylinders and the spiral feed is produced by the provision of spiral driving bars, connected through a gearbox to the broach pulleys. It is possible to change the machine from spiral to straight broaching.



Standing 16 ft. high and having a ram pressure of 30 tons, this Colonial vertical broaching machine was installed by Buick for broaching spiral splines in gears. Next to the huge machine is a conventional-size model



Kane & Roach No. 2 Straightening Roll

Two power-driven straightening rolls are employed in the No. 2 rotary straightening roll to straighten stock at speed from 50 to 75 ft. per min. This machine, built by Kane & Roach, Inc., Syracuse, N. Y., is equipped with one set of feed and delivery tubes. The rolls are carried in Timken bearings and the design of the machine is such as to permit changing the angle of tilt of the rolls to meet varying conditions. The capacity of the machine is as follows: Mild steel rounds, 1/4 to 3/4 in.; heat-treated steel rounds, 1/4 to 5/8 in., and tubing up to 1 1/8 in. Approximate shipping weight is 5,300 lb.

Maas & Waldstein Anti-Corrosion Enamel

Especially designed to prevent corrosion of iron and steel in industrial service, a line of air-drying enamels has been announced by Maas & Waldstein Co., Newark, N. J.

The anti-corrosive enamels are made of rust inhibiting pigments and a synthetic resin, and form a hard, tough coating. Exposure tests, conducted over a long period show that they are effectively protected against humidity, salt water, alkali, and a variety of chemicals, and prevent electrolytic action.

Enamels are applied by brush or spray, and air-dry in four hours and hard overnight. Types for baking for one hour at 250 to 350 degrees F. can also be supplied. Available in brown, black, red, and a bronze liquid, which serves as a vehicle for aluminum and other metallic powders.

Southwark 1,000-Ton Triple-Action Press

Practically four stories in height, the 1,000-ton triple-action hydraulic press supplied by the Baldwin-Southwark Corporation, Philadelphia, to the Fisher Body Corporation has a clear distance of 191 inches between the side housings, while the vertical daylight of the inner slide is 140 inches, slide up. The press stands more than 28 ft. off the ground, while over 14 ft. is below the floor level. Approximate weight of the press is 650,000 lb.

The press utilizes direct-acting hydraulic cylinders, a relatively new development in triple-action presses. Four screw stops on the outer slide allow a varying amount of clamping pressure to be applied at each of the four corners. Four cylinders are employed, each with a 42 in. stroke and yielding 400 tons. For eccentric loading, the inner slide is equipped with a horn-type guide. The cylinders acting upon the inner slide produce a pressure totaling 600 tons. A maximum working stroke of 62 inches is available for the inner slide.

The bottom action, which has a 10 in. stroke, consists of two cylinders of 400 tons total pressure. This is used as the third action. The press is operated by two 285-gal. pumps driven by a 400-hp. synchronous motor. Automatic valves prevent slides from dropping accidentally.

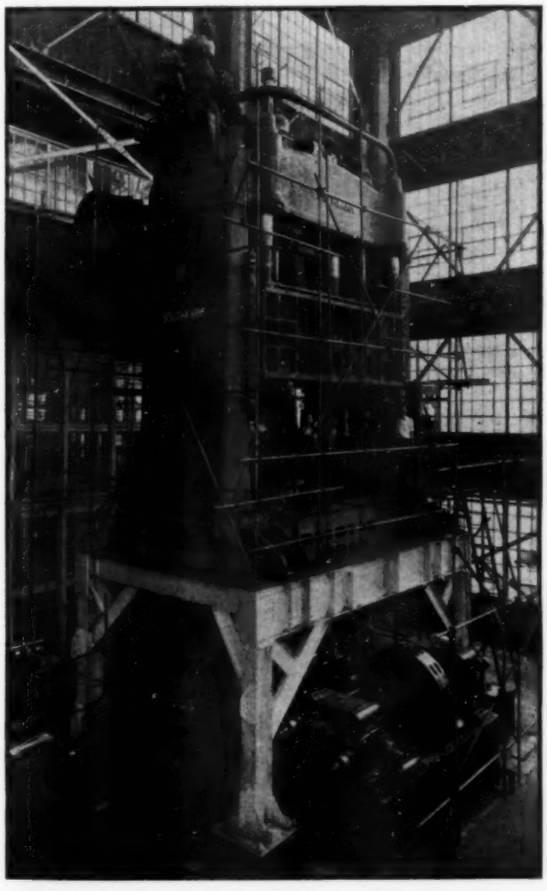
Elmes Hydraulic Drawing Press

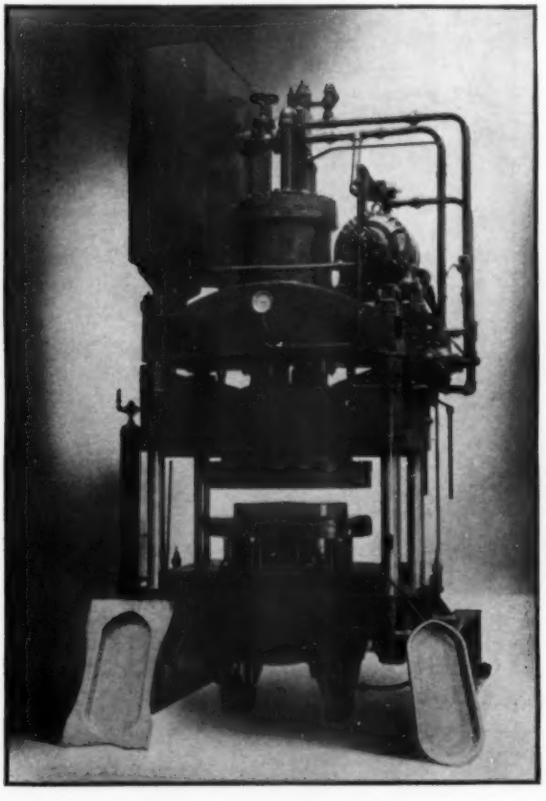
Charles F. Elmes Engineering Works, Morgan & Fulton Sts., Chicago, Ill., is offering the No. 4282 "Duo" drawing press for simultaneous production of different products by individual adjustment of pressure applied on each cushion cylinder. This press is designed for drawing large pieces of the shallower type and permits the use of cheaper grades of drawing steel without loss from torn, sheared or wrinkled pieces. The capacity is 200 tons, the stroke is 18 in., the maximum opening is 34 in., platen surface 61x43½ in. At the base of the press shown are two pieces on either side to show the work done in ordinary steel.

The press has hand or push-button control with rapid advance and return speeds. Full tonnage is secured throughout the entire stroke with uniform pressure regardless of variation of material. A slower rate of drawing allows the metal to flow and the work to be finished free from wrinkles. The moving platen is guided with long guides on round columns with removable split bushings in the moving platen. Hydraulic cushion cylinders and mechanical strippers are included in the press equipment.

Armco "Paintgrip" Galvanized Sheet

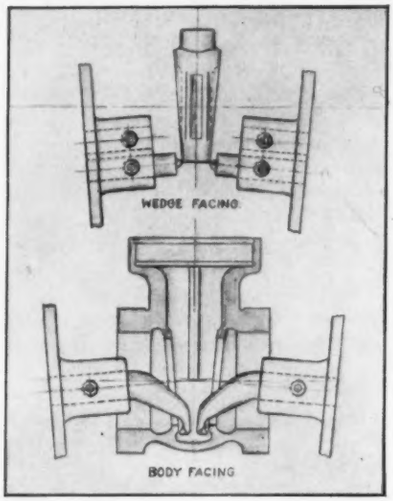
American Rolling Mill Co., Middletown, Ohio, has announced the result of research and development work in producing Armco galvanized "Paintgrip" sheets. It can be painted without special surface treatment by the user. These steel sheets have the value of full coated galvanized sheets, with the added protection of a special insulating coating that keeps the paint from direct contact with the zinc surface. Hence the metal has good physical surface for mechanical adhesion, plus chemical neutrality which retards aging of paint. This treatment is available in any grade of galvanized sheets manufactured by Armco, and is supplied in two surface finishes, regular and extra-smooth. Forming qualities are the same as untreated galvanized sheets with corresponding weights of coating.



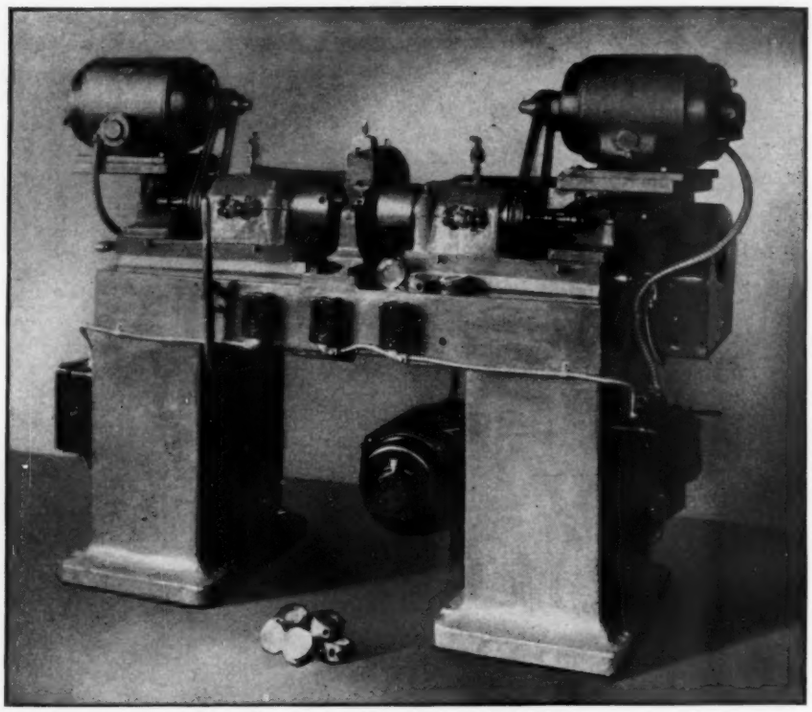


Coulter Gate Valve Body and Wedge Facing Machine

An automatic machine for facing seats on standard brass gate valves and wedges up to 2 in. size has been built by the Automatic Machine Co., Bridgeport, Conn. Both seats are finished simultaneously with a roughing and



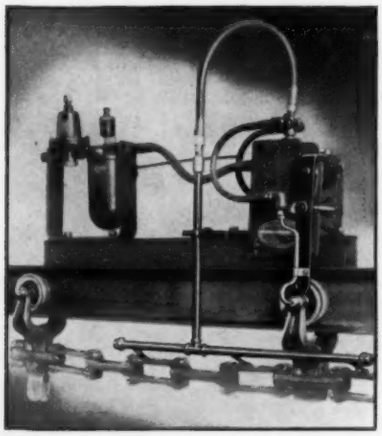
finishing cut. Tool heads and spindles are large and run in ball bearings. The high-speed makes them suitable for the use of carboloy tools. All automatic movements are controlled by suitable camming and the cycle of the machine is from 6 sec. on the smaller sizes of valves to 12 sec. on the larger sizes, and is made possible by change gearing. By changing the work-holding fixtures both body and wedge can be finished on the same machine.



Fauver Automatic Conveyor Lubricator

An automatic conveyor trolley wheel and chain pin lubricator which applies to every bearing lubrication in the form of an oil fog every time it passes a given point, and in the same manner lubricates every pin in the chain links, is announced by J. N. Fauver Co., 91 Selden Ave., Detroit. The self-contained assembly is mounted on the conveyor rail at any convenient point. Pressure from the plant air line is regulated by a Norgren regulating valve and then passes through a Norgren air line lubricator where oil is fed drop by drop to the air stream to form a fine mist.

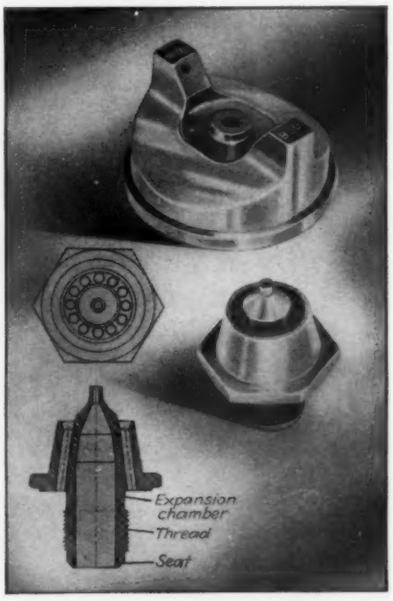
The trolley wheel, passing under the lubricator, trips a trigger which automatically releases a jet of oil fog onto the bearing. Chain link pins are simultaneously subjected to individual jets. Direction and volume of jet are adjustable. Lubricator has sight feed and regulation of volume of oil fed to the air line is subject to accurate control.

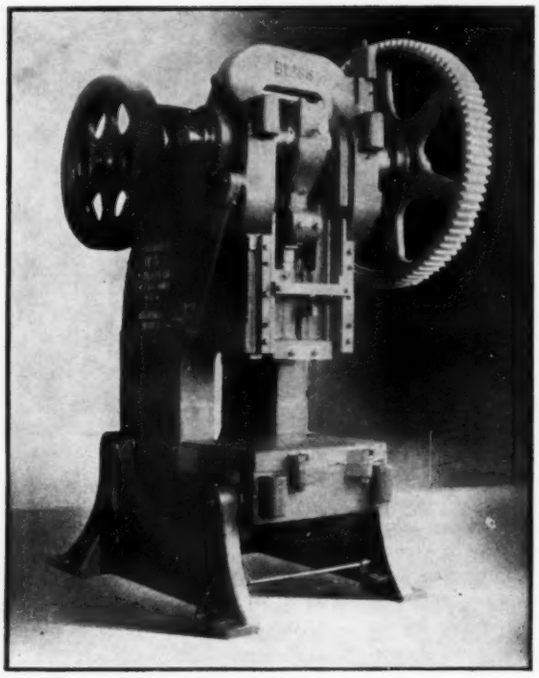


Milburn Nozzles and Atomizer Heads

Paint Spray Equipment division of the Alexander Milburn Co., 1493 West Baltimore St., Baltimore, announces a nozzle made of a wear-resisting steel with long tapered seat, accurately machined and burnished for perfect alignment with atomizer head. Generous air passages, closely spaced, provide a large annular air supply to atomizer head resulting in a perfectly atomized spray. The internal tapered seat is finished to exacting specifications allowing the paint needle point to seat accurately and prevent dripping or spattering. The nozzle seats are on the base of the thread of the head which keeps paint or other material entirely out of the threads, eliminating the usual clogging.

The company's new bronze atomizer head is of simple, one piece design, made with straight air passages to eliminate friction and making it easy to clean. Perfect alignment of seats is assured. Ample air requirements are provided by large non-frictional air passages and expansion chambers which increase the velocity and volume and produce fine atomization at lower pressures.





Consolidated Inclinable Press

E. W. Bliss Co., Brooklyn, N. Y., is offering a new heavy duty, adjustable stroke inclinable press, an addition to the "Bliss-Consolidated" line, built by the Consolidated Press division, Hastings, Mich.

The press is single geared and is arranged for direct connected motor drive. The latest designs in jaw and fast rolling key clutches are offered to suit the service requirements. Timken roller bearings and bronze bushed main and crankpin bearings reduce friction to a minimum. The stroke is adjustable for 2, 4 and 6 in. with a die space of 19 in. for 2 in. stroke, 18 in. for the 4 in. stroke and 17 in. for the 6 in. stroke. The adjustable eccentric is locked rigidly in place by a patented rolling key device and the adjustment is easy and convenient to make. It operates at 40 strokes per minute when geared, and may be arranged for optional geared and non-geared operation in special cases.

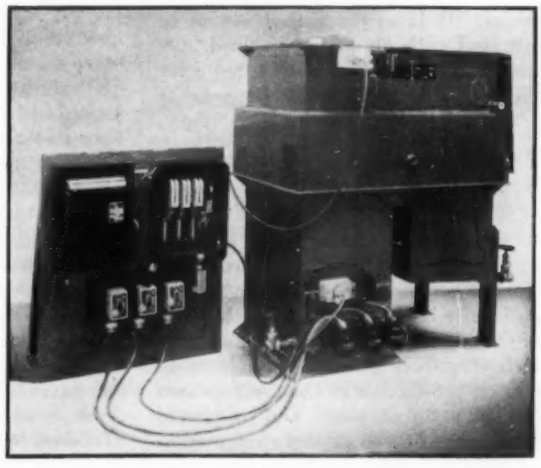
Detrex Size 624 Solvent Degreaser

A two-dip solvent degreasing machine, designated as size 624 has been added to the line of "Detrex" degreasers manufactured by the Detroit Rex Products Co., 13005 Hillview Ave., Detroit, Mich. With this type of degreaser the work is usually handled manually in baskets or on racks, but with heavy loads a small hoist may be employed.

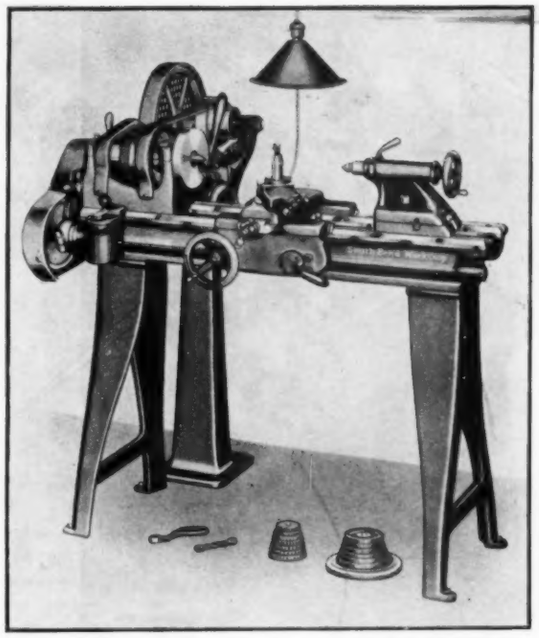
This machine is used for both immersion and vapor cleaning. The usual sequence of operation is to immerse the work in the boiling chamber, cool it in the clean solvent rinse, and finally suspend it for a few seconds in the pure solvent vapors over the boiling chamber. The work is removed clean and dry. This cycle of cleaning operations is accomplished in less than a minute and every trace of oil and grease is removed.

Either "Perm-A-Clor" or "Triad" stabilized chlorinated solvent is used in this machine. These solvents are non-inflammable, non-explosive and have a high solubility factor for oils and greases. The contamination resulting from the cleaning operation is removed from the solvent by periodic distillation within the machine.

Among the important features of this machine are a water jacket type of condenser completely encircling the machine and a solvent condensate collecting trough directly beneath the condenser. By this arrangement the solvent vapors are held within the machine.

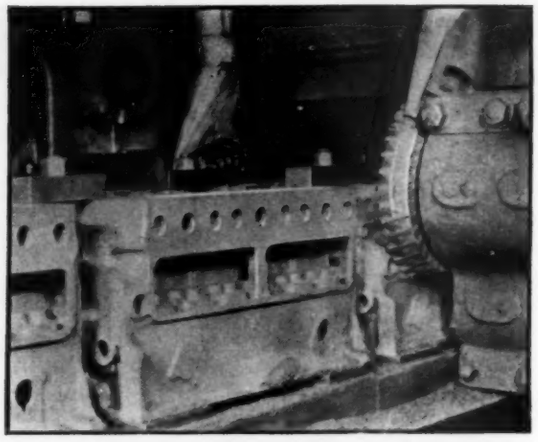


While this Detrex Size 624 degreaser is arranged for electric heating, it is also designed for steam or gas heating.



South Bend 9-In. Work Shop Lathe

The South Bend Lathe Works, South Bend, Ind., announces that the 1936 Model 9-in. work shop lathe can now be had with a pedestal-type motor drive. The mechanism is a separate unit mounted on a pedestal back of the lathe with horizontal counter-shaft and motor supported at the top of the pedestal in line with the headstock cone pulley. An adjustable tension device between the countershaft and the headstock regulates the tension of both the flat belt between the cone pulleys and the V-belt from motor to drive pulley. The motor is entirely apart from the lathe to eliminate vibration and the silent belt drive provides a smooth, steady pull. There are no overhead belts to obstruct vision.



Right — Milling cutters with inserted "Crobalt" blades have been taken up recently in the automotive plants. Roughing and finishing of the valve cover pad on two blocks required 1 min. 4 sec. Length of cut, 28⅞ in.; depth, 1/16 to ⅛ in.

Extra Deep Throat "Doall" Machine

An extra deep throat capacity model of the Continental "Doall" precision sawing machine, known as the "JXD," has all the features of combination sawing and filing for internal and external work that are incorporated in the other models, Continental Machine Specialties, Inc., Minneapolis, announces.

Table area is 22x30½ in. and the throat is 25 in. The table casting and the machine frame casting are nickel iron, heat-treated. The third idler wheel is tiltable as is the main upper wheel, to permit easy and exact "tracking" of the blade.

For band filing, an extension section is coupled into the standard "Doall" file band, to get the extra length for this model. It is so made that it can be operated without using the third idler wheel when doing jobs not requiring the deep throat capacity.

"Crobalt" Non-Ferrous Cutting Alloy

"Crobalt," a cutting alloy for low-cost high-speed cutting of cast iron principally, has been placed on the market nationally both in bulk and in the form of cutting tools by Michigan Tool Co., Detroit. This material has been in limited production in the Detroit area for the past two years, and has found application in two or three large automotive plants. One of these plants has successfully applied Cobalt to the cutting of steel, although the material was originally developed primarily for the cutting of cast iron.

Relatively low cost of the material makes possible the manufacture of the entire cutting tool from the metal. This applies particularly to smaller or medium-sized tools. Moreover, it is easy to braze which is an important consideration in the manufacture of some types of milling cutters.

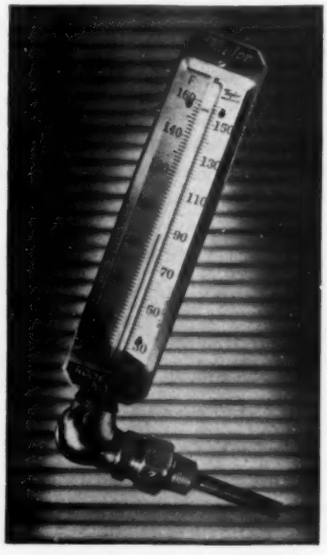
Major ingredients of Crobalt are tungsten, cobalt and chromium combined with certain other constituents said to make possible high uniformity and purity. The alloy is melted in electric furnaces and cast at around 3,000 F. It is said that the properties are not affected by cooling after heating to any temperature below that of melting point, 2,800 F. Therefore, productivity per grind is not apparently affected within a wide range of cutting speed or tool temperature. This makes possible a marked stepping up of production per hour without sacrificing tool life. Frequently, it is possible to cut cast iron without lubrication or artificial cooling even at speeds producing red heat in the tool.

Cutting speeds up to three times those conventionally used with high speed steels have been found to represent a good average in the cutting of cast irons. For turning and boring operations Crobalt is adapted to roughing and semi-finishes, but is not recommended where it is desired to obtain the extremely highly polished surfaces commonly produced with tungsten carbide.

Michigan Tool has announced that the metal will be available in the form of both standard and special cutting tools, and also in bulk to other manufacturers. In addition to turning, forming, facing tools, a complete line of straddle and face-milling cutter blades and assemblies is offered.

"Binoc" Industrial Thermometers

A thermometer tube developed by Taylor Instrument Cos., Rochester, N. Y., and known as "Binoc," gives more than twice the accustomed angle of vision and high magnification of the industrial thermometer's mercury column. It is readable with both eyes, is of triple-lens construction and gathers three times as much light as other types and concentrates it behind the mercury column. Confusing empty-bore reflections are eliminated.



The Round Table

JAM THREADS

"What's wrong with your inspection of parts you buy, Al? It looks to me like some one was getting careless."

"Explain yourself, Ed."

"I was just watching Bill put together that pump casing out there. The nuts didn't fit; he had to use a wrench as soon as he got them started. We'd better find some firm who makes nuts right if you have to do that."

"It does look odd, Ed. But those nuts were ordered that way 'a-purpose,' as we used to say. It does take longer to put them on, I'll admit, but you overlooked one thing."

"Another of your new fangled ideas?"

"Not all mine, Ed. I'm just trying what others have suggested—and use, too, in some cases."

"You must save money to take job-lot nuts that won't fit. Our shop wouldn't accept them. Williams is mighty fussy about bolt and nut inspection."

"It takes just as careful inspection to get nuts with a tight fit as it does with a loose fit. But I'll admit the tolerances don't have to be as close. It's just a way of saving time and getting a good job."

"But Bill was taking a lot of extra time. That's what attracted my attention."

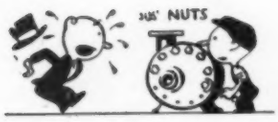
"But you didn't see that the nuts were plain and not castle nuts and that he wasn't spending a lot of time fussing with nut angles so he could put cotter pins in place."

"You wouldn't dare send those pumps out without cottered nuts, Al. It wouldn't be safe."

"That's just what I'm doing, Ed. I remember one well-known machine builder showing me how he put cap screws in so they'd stay. He made them with a little smaller angle than the 60 deg. in the nut, and a bit large. He called it a 'jam thread fit' and it's as good a name as any."

"But doesn't that gum up the threads? Don't they get out of shape, and 'gall'?"

"They get out of shape all right, Ed. The metal flows until they fit—probably better than when we try to cut them just right. But they don't 'gall' if you use a little oil in putting them together."



"Won't they jar loose just as any nut will without a cotter?"

"Apparently not, Ed. I've seen a lot of them used where vibration was bad, and I've done some 'jiggle' testing myself. They seem to stay put."

"It doesn't sound good to me, Al. Give me cotters in mine."

"Well, Ed, I think the jam thread notion is worth trying. It looks O.K. to me and it saves a lot of fussy cottering."

Is Al making a dangerous experiment? Or is he right in trying "jam" nuts?

DISCUSSION

Tools for Every Job

Tool maintenance becomes complicated under a job-tool segregation system. If the tools are kept in individual kits, there they are likely to stay whether sharp or dull.

A shop number system, as touching tools in the crib, and individual toolkits for making up the layouts required for given jobs will probably be most advantageous. Taking the No. 2 pump body as an imaginary case in point, let us say that certain drills, reamers, taps, and other tools allocated to shop numbers leading to storage niches in the toolcrib, are needed for machining the pump body.

Now we have an empty toolkit marked No. 2 pump body. The kit has a compartment for each tool required, and each compartment is marked with the shop number of the tool belonging there. The only instruction the toolcrib attendant needs to make up the tool layout for the No. 2 pump body is the bare toolkit itself.

—John E. Hyler.

Going to Townsend

All that anyone has today was accumulated on the basis of a dollar that would buy a dollar's worth of goods. Bring along the Townsend plan and all the millions of insurance holders, home owners and stock and bondholders will find that their holdings have false values.

Yes, Al, I believe you are right in contending that the Townsend plan would be destructive of prosperity from every angle. But just a moment, Al. There's something wrong with the So-

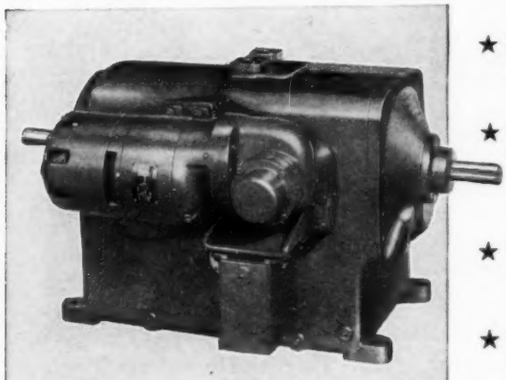
cial Security Act. Have you ever tried to live on $30 per month, or twice that? The crux of the situation is this. The working man must receive returns for his work that will be sufficient for him to do what you are doing—lay something by for old age. Industry's short-sighted policy in neglecting to do that in the past is the reason why we hear so much today about unemployment insurance and old age pensions. Industry must provide for humanity's needs. Had industry justly rewarded the working man, and had the working man been compelled to place a certain percentage of his earnings in an old-age pension fund, the situation would be far different today.

—ROGER C. DICKEY,
International Paper Box Machine Company.

While some measure of security should be provided for the unfortunate, irresponsibility would be the inevitable child of a régime like that sponsored by the Townsend plan. Man should be provided with an incentive that will cause him to do his level best in building up security for himself and his family. Under the Townsend plan we would have an "oh-well-we-are-provided-for-in-old-age-anyway" complex. Such a complex would saddle industrial initiative with a load great enough to sap the last bit of strength from it, leaving it a poor tottering thing at the wayside of a decadent civilization.

The Security Act is more feasible in that it does not propose to yank so many rabbits out of the hat, and the prospect of $30 per month is hardy sufficient to undermine a man's incentive to strive toward something better. Some way should be found to base any pensions that are given to the aged upon their life records. A man who has deliberately chosen to spend his early years in idleness and debauchery is not entitled to share alike with one who has made an honest effort, but who through circumstances beyond his control is genuinely unfortunate. The Townsend plan has within it the seeds of social dissolution and anarchy, no matter what its enthusiastic proponents may honestly believe.

—JOHN E. HYLER.



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Concessions for Kickers

It is not sound business to favor customers as Al suggests. He's just being soft-hearted; I nearly wrote soft-headed. When Al first built his pumps, he figured the cost and presumably fixed a fair price for them. Having done so he should not alter his price for either the Blinker or the Socker Companies. He should point out to the Socker Company that his trouble and expense in getting the first order were to insure that company's satisfaction, and were things set apart from the price of the pump, which is a good buy at its list price.

If the Socker Company goes to some other place for a pump, it just can't be helped, and the extra profit from the Blinker deal will pay for Al's trouble with the Socker Company.

To add sales costs to list prices is impossible, for the buyer would not stand for it. At the same time, it is impossible for Al to achieve the same end by reducing the list price, for conditions vary so much that he would never know where to stop.

The proper way to look at it is to say that the pumps are well worth the price, and then let all the Blinkers and the Sockers cancel themselves out.

—U. S. GRANT,
Leeds, Yorkshire, England.

When to Weld?

If Al has had experience with a small flame cutting outfit, he should be in a position to determine whether or not a larger outfit will prove to be a good investment.

Ed's objections to torch cutting appear to have no justification, if one can judge from the experience of people who have tried it.

Torch cutting and arc welding are not suitable for everything, but any manufacturer who refuses to consider cutting and welding from design and construction standpoints is surely missing out on a good bet. It is difficult to see how Al or Ed, or anyone else, can make up their minds as to the best way of making anything without first considering the different modern methods of manufacture from the cost angle.

—W. A. Walter,
Purchasing Agent,
Pneumatic Scale Corp., Ltd.

Is it possible that there are still manufacturers who have not thoroughly considered this question? We started welding in the manufacture of electric motors twenty years ago. We are still making them from castings and by welding. We make patterns and castings for a single machine whenever it seems to be the best practice, but we also weld certain parts from steel bars and plates whether the quantities are one or more.

But after this experience we are unable to point to any rules or principles that will tell which will be best for any given case. We can only say that we do not think anyone is competent to design machinery today who does not understand both castings and welded plates well enough to determine which is best for each machine part in each particular application.—A. W. Forbes,
Forbes & Myers.

Good Samaritan

It was indeed good news and a real treat to hear and read that many firms had offered to recondition the water-soaked machinery of their make at cost to the hard-hit plants in the flood areas. These offers were undoubtedly made for entirely unselfish reasons and were intended to be contributions from those who had been fortunate to those who had been unfortunate. It was a fine example of helpfulness and generosity, and it gains in importance only when we realize that it was done very quietly during difficult times by hard-headed business men.

The reconditioned machines were of various vintages and used under varying conditions, thus, they gave their builders an unusual opportunity to study weak points and to plan improvements in design or workmanship.

H. J. Gustav Kopsch,
Stuyvesant High School,
New York City.

No, Al is not too generous in offering to recondition the flood-soaked pumps of his manufacture at cost. His men know the pumps better than anyone else and are sure to clean and reassemble them properly, assuring their users of continued service, thereby building up his reputation.

Ed is thinking in terms of dividends. We are not living for today alone, but for tomorrow as well. Al's profit sheets in the future are going to show the results of his kindness to his customers. It isn't gambling on the future, Ed; it's a sure path to greater profits in the years ahead.

—C. D. Rogers,
International Paper Box Machine Company.

A machine tool for shearing metal! The Cincinnati Shear has won high praise from all who use it and from those who have seen it demonstrated. All-steel construction, accurate, fast, with new gauging methods . . . its very appearance expresses efficiency.

THE CINCINNATI SHAPER COMPANY, CINCINNATI, OHIO

TRADE PUBLICATIONS

ABRASIVE CLEANER. Wheelabrator multi-rotary tables for airless cleaning of fragile and intricate metal parts is explained in folder 33, issued by the American Foundry Equipment Co., 555 Byrkit St., Mishawaka, Ind.

ALLOY STEELS. A 43-p., spiral-bound booklet, telling in simple language the story of alloy steels, is available from Carpenter Steel Co., Reading, Pa. The booklet is well indexed and is complete with tables of specifications, and chemical and physical properties of the various alloys are given.

CAST IRON. "The Strength and Elastic Properties of Cast Iron" has been published by Iowa Engineering Experiment Station, Iowa State College, Ames. It is the work of W. J. Schlick and Bernard A. Moore, and includes an extensive bibliography of cast iron research and a review of literature. It is available from the college without charge.

ELECTRICAL SWITCHES. Commemorating its 100th anniversary of manufacturing, Colt's Patent Firearm Mfg. Co., Hartford, Conn., has issued a catalog of more than 400 pages describing the company's line of switches, fuses and control equipment. The catalog will be mailed to readers requesting it from the electrical division of the company.

FLEXIBLE COUPLINGS. A 15-p. catalog showing the company's line of flexible couplings, including tables of specifications and ratings, and numerous illustrations, is available from American Flexible Coupling Co., Erie, Pa.

FLEXIBLE COUPLINGS. Diamond Chain & Mfg. Co., Indianapolis, has published a bulletin on the company's line of flexible couplings, with tables of ratings and sizes, and illustrations showing applications.

MOLDING MATERIALS. "Bakelite Molded," seventh edition, a 48-p. booklet on molding materials, molding processes and tests, has been issued by Bakelite Corp., 247 Park Ave., New York. It is profusely illustrated with photographs of a wide range of products made from Bakelite.

PRESSES. Clearing crankless steel power presses are illustrated and described in a 24-p. booklet just released by Clearing Machine Corp., 6499 West 65th St., Chicago.

SHIMS. A short cut to understanding the use of shim-shields is a feature of a booklet on shims issued by National Motor Bearing Co., 1197 78th Ave., Oakland, Calif.

STAINLESS TUBING. Carpenter Steel Co., Welded Alloy division, 347 Madison Ave., New York, has issued a booklet "Helpful Data on the Properties and Use of Carpenter Stainless Welded Tubing."

THERMOMETERS. Bulletin 99023 describes the new "Binoc" industrial thermometers developed by Taylor Instrument Cos., Rochester, N. Y.

THREAD GRINDING. Jones & Lamson Machine Co., Springfield, Vt., has issued a brochure on specifications of the automatic thread grinding machine recently announced by the company.

VENTILATION. The Swartwout method of natural ventilation for manufacturing plants is explained in a 16-p., non-technical booklet just off the press. Ask for Bulletin V-100-B when writing Swartwout Co., 18511 Euclid Ave., Cleveland.

Hot Rolled Alloys
S.A.E. 2315, 2320, 2330, 2335, 2340, 2345, 2350, 3115, 3120, 3130, 3135, 3140, 3250, 4140, etc.
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Cold Drawn Alloys
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